Provo River
Restoration Project

Final Environmental Impact Statement

DECEMBER 1997

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

Utah Reclamation Mitigation and Conservation Commission (Lead Agency)
U.S. Department of the Interior (Joint Lead Agency)

UTAH RECLAMATION
MITIGATION
AND CONSERVATION
COMMISSION

102 West 500 South #315, Salt Lake City, Utah 84101
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December, 1997

Dear Reader:

This Final Environmental Impact Statement (FEIS) on the proposed Provo River Restoration Project (PRRP) was prepared by the Utah Reclamation Mitigation and Conservation Commission. The U.S. Department of the Interior, Office of Central Utah Project Completion, is joint-lead agency with the Mitigation Commission for this Final EIS. The Mitigation Commission is charged with restoring fish and wildlife habitats as compensation for impacts to these habitats caused by federal reclamation projects in Utah. The PRRP is proposed as a means to fulfill a portion of the Mitigation Commission's fish and wildlife mitigation and conservation program. The PRRP's Proposed Action along the middle Provo River is analyzed in this FEIS for its impact on the social and natural environment. Three other alternatives are analyzed along side the Proposed Action.

Readers familiar with the Draft EIS will note several changes from the Draft to the Final. They are summarized as:

- The Summary was expanded to provide a more complete overview of the project. Additionally, a section was added to the Summary that identifies what major changes were made to the Proposed Action or to the FEIS based on agency and public comment on the DEIS.
- A number of changes were made to the organization and introduction of Chapter 1 to increase readability. Additionally, separate sections were added to explain the difference between baseline conditions and the alternatives and to explain the proposed management of the corridor under baseline conditions.
- The PRRP FEIS is a stand alone document. The PRRP Draft EIS was issued together with the Wasatch County Water Efficiency Project and Daniel Replacement Project Draft EIS in one document.

Additional copies of the DEIS, this FEIS, or a stand alone Summary of the FEIS may be obtained from:

Judy Tamagawa
Utah Reclamation and Conservation Commission
102 West 500 South #315
Salt Lake City, Utah 84101

Sincerely,

Jody L. Williams

Don A. Christiansen, Chairman
Utah Reclamation Mitigation and Conservation Commission

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

FINAL ENVIRONMENTAL IMPACT STATEMENT ON THE PROVO RIVER RESTORATION PROJECT

Prepared by
Utah Reclamation Mitigation and Conservation Commission

December 1997

Jody L. Williams

Don A. Christiansen, Chairman
Utah Reclamation Mitigation and Conservation Commission

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COVER SHEET

Provo River Restoration Project (PRRP)

( ) Draft (X) Final

Joint Lead Agencies

Utah Reclamation Mitigation and Conservation Commission
U.S. Department of the Interior

Cooperating Agencies

U.S. Department of Army, Corps of Engineers
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Bureau of Reclamation
U.S. Department of Agriculture, Natural Resources Conservation Service
U.S. Department of Agriculture, Forest Service
Utah Department of Natural Resources
Central Utah Water Conservancy District
Wasatch County Special Service Area No. 1

Counties that Could be Affected

Wasatch, UT

Abstract

This Final Environmental Impact Statement (FEIS) covers the Provo River Restoration Project (PRRP). The PRRP responds to the need to mitigate past impacts of the Central Utah Project and other federal Reclamation projects by improving fish and riparian habitats on a ten-mile reach of the Provo River in Wasatch County, Utah, between Jordanelle Dam and Deer Creek Reservoir. The Provo River in the Project Area was channelized and diked extensively during the 1940s and 1950s. The Proposed Action (Riverine Habitat Restoration) would reconstruct and realign a majority of the existing Provo River channel and floodplain system in the Project Area into a meandering riffle-pool sequence to re-create a naturally functioning river channel connected with its floodplain. Side channels, wetlands and ponds would be constructed on both sides of the new river alignment to provide diversity and unique habitat features. One alternative (Existing Channel Modification) would modify the existing channel using a step-pool sequence to control water velocity and stabilize stream banks. Another alternative (Instream Structures) would install instream fish habitat structures at selected locations along the Provo River. Neither of these alternatives would involve major channel realignment. The No Action Alternative would not stabilize the river bed and banks, restore riverine habitat or improve fish habitat. Major environmental issues involve water resources, wetlands, aquatic resources, wildlife, threatened and endangered species, agriculture, socioeconomics and recreation.

Other Requirements Served

This FEIS is intended to serve other environmental review and consultation requirements pursuant to 40 CFR 1502.25 (a).

Date DEIS Made Available to EPA and the Public: MC DES 96-01, June 10, 1996

Date FEIS Made Available to EPA and the Public: MC FES 97-01, December , 1997

Preface

This document contains the Final Environmental Impact Statement (FEIS) for the Provo River Restoration Project (PRRP). It should be noted that when the PRRP Draft Environmental Impact Statement was released, the same document also contained the Wasatch County Water Efficiency Project and Daniel Replacement Project Draft EIS. After completion of the public review process, the decision was made to prepare separate final EISs.

This Final EIS contains the following sections: the Summary, Chapter 1 (Description of the Proposed Action and Alternatives), Chapter 2 (Comparative Analysis of Impacts of the Proposed Action and Alternatives), Chapter 3 (Affected Environment and Environmental Consequences), and Chapter 4 (Consultation and Coordination). Chapter 4 has been expanded from the Draft EIS to include all the comment letters that were received on the Draft EIS along with the responses to each comment. Additionally, statements made at two public hearings on the Draft EIS have been reviewed, and responses prepared and included in Chapter 4. The FEIS also includes nine appendices. Seven technical reports have also been prepared that support the technical analysis and findings of the FEIS.

Copies of the technical reports and Final EIS are available from the following address:

Utah Reclamation and Conservation Commission
102 West 500 South #315
Salt Lake City, Utah 84101

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Provo River
Restoration Project

SUMMARY

Final Environmental Impact Statement

Summary

S.1 Introduction

The Provo River Restoration Project (PRRP) is simple in its objective: to create a more naturally functioning river system for the middle Provo River between Jordanelle Dam and Deer Creek Reservoir. It is more complex in its execution. It is complex because the execution involves not only an understanding of the physical environment but also the social. This Final Environmental Impact Statement (FEIS) reflects an analysis of both.

S.1.1 A Brief Background in Why and How This FEIS was Prepared

The National Environmental Policy Act (NEPA) requires all federal agencies - with projects that may significantly affect the environment - to prepare an assessment of the proposed project's potential environmental effects. Once the federal agency develops a proposed action, the public is invited to comment on the proposed action and suggest ways to lessen any potential negative effects. The effects of the proposed action and any alternatives on the social and physical environment are then evaluated. This process is designed to lead to the ultimate goal of the NEPA process - which is to provide factual information, which has been reviewed by the public, to assist the decision maker in selecting the preferred alternative.

In the case of the PRRP, the complex history that led to the development of the proposed action and alternatives is briefly described in this summary (see Section S.2) and more completely in Chapters 1 and 4 of the FEIS. Modifications made to the Proposed Action as a result of comments on the DEIS are summarized in Section S.3 below. The effects are briefly described in this summary (see Section S.5) and more completely in Chapter 3 of the FEIS.

S.1.2 What to Expect in This Summary

The following sections summarize each chapter of the Provo River Restoration Project Final Environmental Impact Statement. The summary of Chapter 1 provides an overview of the Proposed Action and Alternatives evaluated in the FEIS. It includes a section that explains what changes were made to the Proposed Action to address major concerns expressed during review of the DEIS. The summary of FEIS Chapters 2 and 3 contains a short description of the impacts of the Alternatives on resources of interest, for example, wetlands and agricultural lands. The summary of Chapter 4 reviews the consultation and coordination that occurred with the public and federal, state and local governments to produce the FEIS.

S.2 Summary of Chapter 1 - Description of The Proposed Action and Alternatives

S.2.1 The Development of The Proposed Action and Alternatives

The origin of the PRRP is closely tied to federal reclamation projects in Utah, especially the Central Utah Project (CUP) and the Provo River Project. The CUP is a large water development project that transfers water normally flowing to the Colorado River to the Bonneville Basin through a series of pipes, aqueducts and reservoirs. As a consequence of CUP construction, fish and wildlife habitat have been negatively affected. For example, water was diverted out of streams on the south slope of Uintas for storage in Strawberry Reservoir which in some instances eliminated fish habitat. There exists an obligation on the part of the federal government to mitigate these impacts to fish and wildlife. The PRRP is also being undertaken under the general authority of the Secretary of the Interior to manage and correct problems arising from federal reclamation projects. The Provo River Project was authorized in 1933 and constructed during the 1940s and 1950s. Specifically, the Provo River Channel Revision component of the project led to the diking and channelization of much of the Provo River in Heber Valley. Impacts to fish and wildlife habitats were not systematically evaluated or mitigated. Prior to 1992, mitigation measures included angler access and stream habitat improvement projects on numerous streams in the Bonneville Basin. In 1992, Congress created the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) to assure that mitigation for the CUP and other federal reclamation projects in Utah was accomplished.

With the creation of the Mitigation Commission, new standards were imposed on mitigation projects that can be summarized as an "ecosystem restoration" standard. With this mandate the Mitigation Commission was directed to support mitigation projects that integrated multiple aspects of the environment. For example, rather than just putting water back into streams for fish, a project should also include the water necessary to support streamside vegetation that is a critical component of healthy fish habitat. For a complete description of the source of the mitigation obligations and the creation of the Mitigation Commission see Chapter 1, Section 1.1.1.

S.2.2 Interest in The Provo River to Satisfy Mitigation Obligations

Prior to the 1950s the middle Provo River offered outstanding fish and wildlife habitat. This was due in part to the Provo River freely meandering through Heber Valley. These bends in the river provided deep holes for fish and a dense streamside forest for many species of birds. This productive habitat was altered in the 1940s and 1950s when the river was dammed, channelized and placed between dikes. These dikes were constructed by the U.S. Bureau of Reclamation to contain high flows that came from additional water added to the Provo River from transmountain diversions, as part of the Provo River Project. With the loss of the meandering channel came loss of fish and wildlife habitat. See Figure S-1 for an aerial view of the middle Provo River as much of it looks today because of channelization.

Knowing the past productivity of the middle Provo River for fish and wildlife habitat, interest turned to the middle Provo River as a site for CUP mitigation. Prior to 1992 it was suggested that structures be added to the Provo River to create pools and other habitat for fish as a mitigation measure. This resulted in one of the three alternatives: the Instream Structures Alternative. The Mitigation Commission expanded upon this obligation in order to meet its "ecosystem restoration" standard and developed the Proposed Action, which includes returning the middle Provo River to a more naturally functioning condition in order to support additional aquatic species and restoration of wildlife habitat, which more fully responds to the need for mitigating impacts on riparian habitats inundated by Jordanelle Reservoir. The Existing Channel

Figure S-1 The Middle Provo River Today

Modification Alternative exists between the Proposed Action and Instream Structures alternatives in its ecosystem design.

S.2.3 A Summary Description of The Proposed Action and Alternatives

S.2.3.1 The Proposed Action (Riverine Habitat Restoration)

- Reconstructs and realigns most of the existing river channel and floodplain system in a meandering riffle-pool sequence (where there are alternating shallow and fast and deeper and slower sections of water).

- Removes existing levees; however, 100-year flood protection would still be provided by the expanded floodplain or new setback levees.

The new floodplain would be subject to flooding once every 2 years and once every 5 years with velocities capable of scouring surface soils - these conditions are necessary for natural regeneration of cottonwood trees and other riparian vegetation.

- Allows the river to flood onto the expanded floodplain and to alter its course (the river channel may widen or move across the floodplain in response to natural forces similarly to how it functioned before channelization).

- Revegetates disturbed areas along the new floodplain with indigenous plants.

- Constructs side channels and ponds on both sides of the new river alignment. These would create diverse habitat conditions for spawning and rearing of fishes, especially non-game fishes and other aquatic or amphibious species.

See Map A-1 (located in the map pocket at the back of the FEIS) for the location of the major physical features of the Proposed Action.

S.2.3.2 Existing Channel Modification Alternative

- Reconstructs, within the present channel alignment, a "step-pool" or rapid-pool system. That is, the channel would be comprised of a series of alternating steps (nearly vertical drops in the channel bottom) and pools.

- Stabilizes the existing river channel by making channel modifications with multiple rock weirs and large boulders.

- Revegetates disturbed areas along the existing channel with indigenous plants.

See Map A-2 (located in the map pocket at the back of the FEIS) for the location of the major physical features of the Existing Channel Modification Alternative.

S.2.3.3 Instream Structures Alternative

- Installs instream fish habitat structures at selected locations along the Provo River between Jordanelle Dam and Deer Creek Reservoir making no significant changes to the existing river channel shape or elevation.

S.2.3.4 No Action Alternative

- The No Action Alternative would not make any changes to the Provo River channel, its riparian corridor, or its fish and wildlife habitats.

S.2.4 Baseline Mitigation Requirements

Even if the No Action Alternative is not selected, there will still be mitigation activity along the middle Provo River as the result of prior commitments. These activities include the following measures.

- Providing seven new recreation access points along the Provo River between Jordanelle Dam and Deer Creek Reservoir including parking and restroom facilities;

- Providing pedestrian access for fishing and related or compatible uses along the Provo River between Jordanelle Dam and Deer Creek Reservoir;

- Fencing of the public access corridor to control trespass problems;

- Managing the acquired corridor and constructed access facilities through a management agreement with a state or local entity;

- Maintaining a minimum instream flow of 125 cfs in the Provo River below Jordanelle Dam.

These commitments constitute the baseline conditions for many resources that would be impacted by the Proposed Action and alternatives. Note also that if the No Action Alternative is selected, the Mitigation Commission is still required to develop and implement measures to meet the Project Need to which the Proposed Action and other alternatives respond. See Chapter 1, Section 1.2.1 for a description of the Project Need and Section 1.4 for a detailed description of the "baseline."

S.2.5 A More Detailed Look at The Proposed Action and Alternatives

It is commonly stated that "a picture is worth a thousand words." Figure S-2 provides a schematic picture of what a typical segment of stream channel would look like under the Proposed Action and each alternative.

As illustrated in the figures, the Proposed Action and alternatives range from less to more complex. Under the No Action alternative no changes are made to the straightened stream channel. The Instream Structures Alternative adds a bit more complexity in the form of structures added to the river to create some fish habitat. The Existing Channel Modification Alternative develops more diversity within the channel by making vertical adjustments to the stream channel to create a step-pool river. The Proposed Action provides the most complexity in adding additional channel features as well as meanders, backwater areas and side channels and a broader floodplain. To further illustrate the differences, it is useful to view the possibilities from an aerial point of view. The computer-enhanced image (Figure S-3) helps to visualize the meandering river with a wide riparian corridor that is expected to occur under the Proposed Action as it connects the river to the floodplain. As the two action alternatives limit river enhancements to the existing river channel, the corridor would resembled that represented in Figure S-1.

S.2.6 A Final Key Difference Between The Proposed Action and Alternatives Related to Time

The differences presented above relate to how the Proposed Action and alternatives will physically alter the river channel and/or corridor from its present condition. The functional differences were also presented; for example, the Proposed Action connects the river to the floodplain, whereas the Instream Structures Alternative does not. This will affect the degree to which the riparian corridor is sustained. An equally important difference is that the Proposed Action is designed to maintain a river system over time that will provide wildlife habitat without the need for extensive human intervention. The Existing Channel Modification Alternative and Instream Structures Alternative will both need human inputs to maintain the structures.

This summary only presents the rationale behind the creation of the Proposed Action and alternatives and the concept. See Chapter 1, Section 1.3 for a more detailed summary of the Proposed Action and alternatives and Chapter 1, Sections 1.4, 1.5, 1.6 and 1.7 for detailed descriptions of them.

S.3 Public Concerns

The Proposed Action and the two action alternatives represent a change from the existing condition and baseline within the Project Area. Concerns were expressed about the proposed changes through public meetings and comments. Questions were raised about what would happen to resources of interest if the Proposed Action and alternatives were implemented. For example, what would be the impacts to wetlands or agriculture if the Proposed Action were implemented? Several changes were made to the Proposed Action and analysis to address those concerns. The most substantial changes that respond to the major concerns on the Draft EIS are summarized below. Additional concerns are addressed in Section S.5.

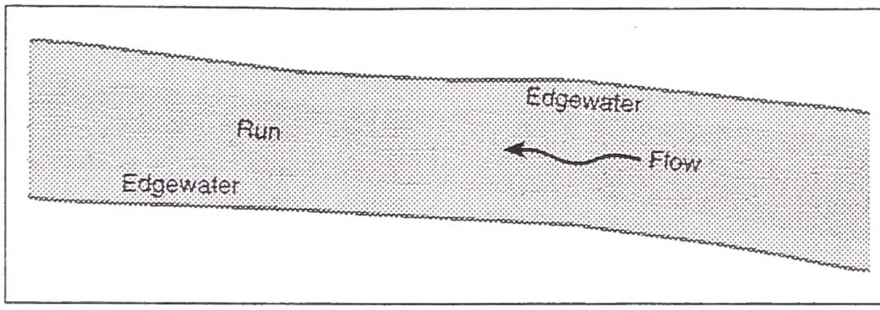
S.3.1 Acquisition of Private Property

S.3.1.1 Issue

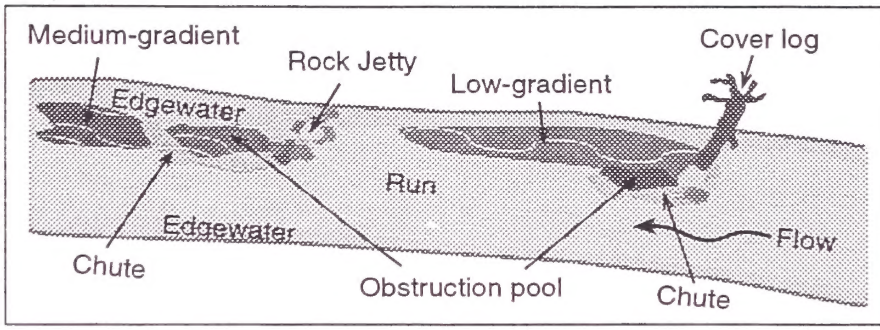
The concern was expressed that acquisition of narrow corridors, particularly associated with side channels in the floodplain, would create unusable "islands" of private property within government ownerships. Also, there were concerns that acquisition of parcels from private landowners along the river corridor would create "uneconomical remainder" parcels; and concerns that eminent domain not be used to acquire property.

S.3.1.2 Response

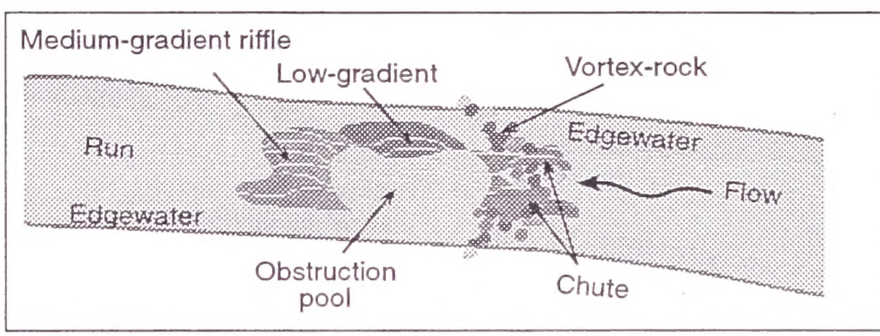
Two new concepts were added to the FEIS to address these concerns: the identification of a *Core Area* and an *Expanded Restoration Area*. The Core Area is composed of lands required to implement and manage the alternative. The Expanded Restoration Area consists of additional lands with potential for additional riparian or wetland developments, or for protection of wildlife habitats. All alternatives have a Core Area but only the Proposed Action includes



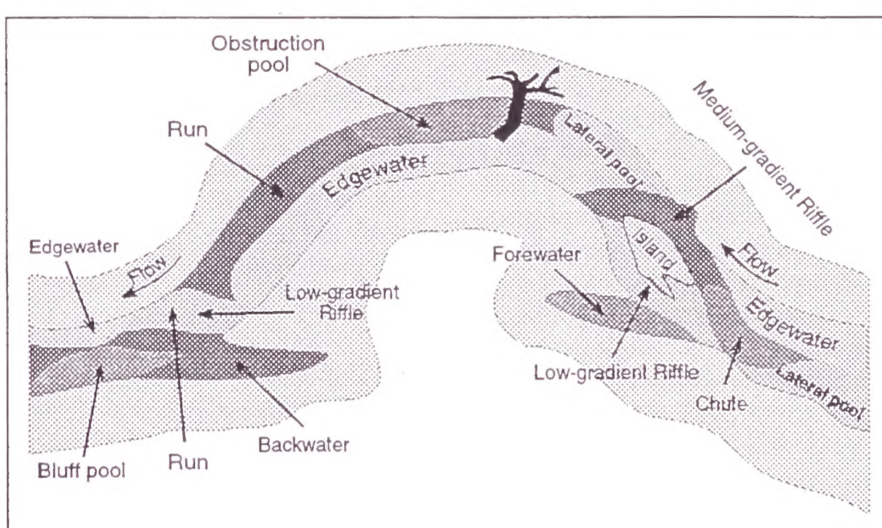
The No Action Alternative



The Instream Structures Alternative



The Existing Channel Modification Alternative



The Proposed Action (Riverine Habitat Restoration)

Figure S-2 Schematic Illustrations of a Segment of Stream Channel Under the Proposed Action and Each Alternative

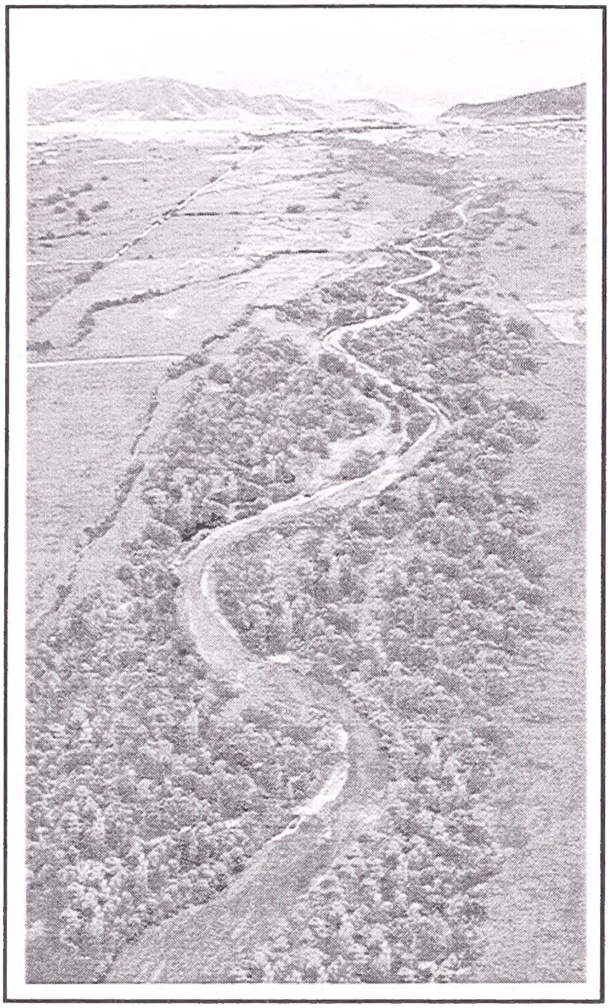


Figure S-3 A Computer-Enhanced Image that Represents What The Middle Provo River is Projected to Look Like With Implementation of the Proposed Action (Riverine Habitat Restoration)

an Expanded Restoration Area. The Expanded Restoration Area was identified in those areas where there are concerns over unusable islands or "uneconomical remainders" as a way of offering to acquire additional lands, on a willing-seller basis only, to accomplish additional ecosystem restoration or wildlife habitat protection objectives beyond the Core Area requirements. Eminent domain would be used to acquire the Core Area, but only as a last resort.

S.3.2 Modifications to the Proposed Action Through Reaches 8 and 9 to Reduce Impacts to Wetlands and The Spotted Frog

S.3.2.1 Issue

Concerns were expressed that the Proposed Action alignment through Reach 8 would negatively affect wetlands (both USBR-constructed mitigation wetlands and other existing wetlands) as well as spotted frog populations, both of which would require extensive mitigation.

S.3.2.2 Response

Based on these concerns changes were made to the Proposed Action to retain the main Provo River channel in Reach 8 in approximately its existing alignment, but to reconstruct it in a meandering pattern. This will avoid the impacts to wetlands and particularly reduce potential impacts on spotted frog populations. This channel alignment shift will reduce the required wetland mitigation for the Proposed Action substantially, which in turn will reduce the amount of additional private property that would have been needed in order to complete wetland mitigation.

S.3.3 Modifications to The Proposed Action Through Reach 4 to Allow the Channel to Self-Correct

S.3.3.1 Issue

There was a concern that Reach 4, which had never been channelized, was in a relatively natural condition and the channel work identified under the Proposed Action in the DEIS might not be necessary.

S.3.3.2 Response

Based on this concern and information gathered in 1997, a reduced amount of reconstructed main channel is included under the Proposed Action in Reach 4. Reach 4 monitoring in 1997 revealed that substantial improvements in channel stability, riparian growth and geomorphological trends have occurred in the past few years. The existing channel

in Reach 4 appears headed towards the goals established for the Proposed Action. Therefore only several short stretches of channel are proposed for reconstruction. Acquisition of the flood-prone area, already under existing government easements, will provide protection for the channel and allow constructed improvements to persist.

S.3.4 Management and Recreational Use of The Corridor

S.3.4.1 Issue

Interest was expressed in knowing who would manage and how the river corridor would be managed for recreational uses.

S.3.4.2 Response

Section 1.4.2 in Chapter 1 describes who would manage and how the river corridor would be managed. That section indicates that the Mitigation Commission proposes to develop an operating agreement(s) with Wasatch County, the Utah Division of Wildlife Resources and possibly other appropriate entities for management of the corridor. The Operating Agreement will identify who is responsible for the following tasks:

Regular Trash Collection at Parking Areas
Litter Control Along the River Corridor
Routine Maintenance of Fences, Trails, Signs, Rest Rooms and Parking Lots
Enforcement of Parking Limits
Fish and Wildlife Law Enforcement
Enforcement of Traffic Laws
Peace Keeping
Trespass on Private Lands
Search and Rescue
Fee Collection and Administration
Information and Education
Volunteer Management
Biological/Resource Management

The Operating Agreement will also specify costs of management, and commit funding sources to support ongoing development, operation and maintenance, and management of the project. Funding sources and assistance with management and operation and maintenance may include one or more of the following: user fees; volunteer efforts (Riverkeeper program); Mitigation Commission funds; state or local funds; private donations.

S.3.5 Recreational Angling Use of The Corridor

S.3.5.1 Issue

Concern was expressed that the number of anglers projected to use the river corridor was underestimated, and that the impact of those users was also underestimated.

S.3.5.2 Response

Based on this comment the FEIS contains a re-analysis of recreational angling use under baseline conditions and under the Proposed Action and each alternative (Section 3.16). The impacts of the increased recreation use has been addressed in appropriate sections of Chapter 3, including Section 3.12 Socioeconomics.

S.4 Summary of Chapter 2 - Comparative Analysis of The Proposed Action and Alternatives

Chapter 2 in the FEIS summarizes the major differences among the impacts of the Proposed Action and Existing Channel Modification and Instream Structures Alternatives. The impacts summarized include those to aquatic resources, wetlands, wildlife, agriculture, socioeconomics, transportation and recreation resources.

The No Action Alternative would not involve any changes to the current river alignment or other baseline conditions. Restoration of the Provo River between Jordanelle Dam and Deer Creek Reservoir would not occur. None of the positive impacts associated with the Proposed Action or any of the alternatives would occur if the No Action Alternative was implemented.

S.5 Summary of Chapter 3 - Affected Environment and Environmental Consequences

This section of the summary identifies the major issues of concern identified by the public or agencies during scoping, or by the EIS team during the analysis. These are presented as questions that the public, agencies or team had about what would happen if the Alternatives were implemented and are answered in the "impact analysis". Questions were raised about what would happen to water resources, wetlands, aquatic resources, wildlife resources, threatened and endangered species, agriculture, socioeconomics and recreation resources under each Alternative. Chapter 3 contains detailed answers to those questions. This summary contains the major conclusions.

S.5.1 Water Resources

Question: What impacts would the PRRP have on reducing peak flow rates from Jordanelle Reservoir during the summer months?

Impact Analysis: The Proposed Action or none of the alternatives would affect delivery of water contracts or water rights from or through Jordanelle Reservoir. The Proposed Action would increase surface water travel time by an average of 1 hour for flows from Jordanelle to Deer Creek Reservoir because of the longer channel and slower flow velocities. The Existing Channel Modification and Instream Structures alternatives would increase water travel time by an average of about 12 minutes. The Proposed Action could increase groundwater levels by about 1 to 3 feet in the northern portion of the valley adjacent to the river depending on the final design elevation of the river channel. These groundwater level increases would be associated with changes in the grade and length of the river channel, which affects the surface area and seepage interaction between the river and groundwater basin.

S.5.2 Wetlands

Question: How would construction of the PRRP impact wetlands?

Impact Analysis: The Proposed Action and Existing Channel Modification Alternative would increase riparian woodland, wet meadow, emergent marsh and shrub wetlands along the Provo River. Construction procedures under the Proposed Action would directly impact 28.2 acres of wet meadow, emergent marsh and shrub wetlands, but all would be restored under Standard Operating Procedures (SOPs; see Section 1.9.6.1 of Chapter 1 for a complete listing of SOPs). Construction of the Proposed Action would permanently remove 80.0 acres of wetlands. About 287.6 acres of wetland and riparian habitat would be developed under the Proposed Action, for a net increase of 207.6 acres. The Existing Channel Modification Alternative would permanently remove a total of 63.1 acres of wetlands, and would create 141.9 acres of riparian and wetlands habitat, for a net increase of 78.8 acres. The Instream Structures Alternative would have no measurable impacts on wetlands.

Question: How would changes in the groundwater table impact wetlands?

Impact Analysis: The Proposed Action or any of the alternatives would not have measurable effects on groundwater levels on a regional basis. The Proposed Action could increase groundwater levels by about 1 to 3 feet in the northern portion of the valley adjacent to the river depending on the final design elevation of the river channel, which could affect some wetlands on a localized basis. Under the Proposed Action, floodplain features such as wetlands and ponds would be constructed to take advantage of high groundwater tables near the Provo River corridor, creating diverse wetlands and wildlife habitats.

S.5.3 Aquatic Resources

Question: What opportunities would the Proposed Action and Alternatives have for developing side channels to benefit fish spawning and rearing?

Impact Analysis: Only the Proposed Action would include construction of side channels, which would benefit both game and non-game species, including the leatherside chub (a species of special concern that may benefit from these habitats). As much as 50,070 feet of side channels could be developed under the Proposed Action, although locations and design parameters will depend on land acquisition and final designs.

Question: What would be the impacts on fish, fish habitat and other aquatic resources from the PRRP?

Impact Assessment: The Proposed Action and Existing Channel Modification and Instream Structures alternatives would increase trout biomass in the Provo River between Jordanelle Dam and Deer Creek Reservoir and also benefit non-game fish and other aquatic resources. In each case, it would take about 5 to 20 years to reach the predicted level of trout standing crop described below. The Proposed Action would increase trout biomass by about 25,212 pounds a year, or 481 percent. It also would increase aquatic habitat surface area by 13.8 acres, or 15 percent, compared to baseline conditions because of the longer channel length. The Existing Channel Modification Alternative would increase trout biomass by about 7,904 pounds per year, or 151 percent, but would decrease aquatic habitat surface area by 17.9 acres, or 20 percent, compared to baseline conditions. The Instream Structures Alternative would increase trout biomass by about 3,076 pounds per year, or 59 percent, and would not change aquatic habitat surface area from baseline conditions. Nongame fish species and other aquatic resources are expected to have similar impacts as described for trout species. These changes will occur over a period of two to 20 years as the Project Area responds to changes made to the river and floodplain under the Alternatives.

S.5.4 Wildlife Resources

Question: What would be the potential impacts of construction on wildlife and their habitat?

Impact Analysis: Construction of the Proposed Action and Existing Channel Modification and Instream Structures alternatives would temporarily disturb game and non-game wildlife species, but significant adverse impacts would be avoided. The Proposed Action would cause a net increase of 207.6 acres of riparian and wetland wildlife habitat, which would develop over 2 to 30 years depending on habitat type. Abundance and diversity of breeding birds would increase significantly under the Proposed Action. Riparian-dependent bird species would especially increase. About 310 acres of existing wildlife habitats would be improved and protected within the Project Area under the Proposed Action. The Existing Channel Modification Alternative would cause a net increase of 78.8 acres of riparian and wetland wildlife habitat, which would develop over 2 to 30 years depending on habitat type. Increases in breeding bird diversity and abundance would also occur under the Existing Channel Modification Alternative. The Instream Structures Alternative would not change the area or quality of wildlife habitat.

Approximately 13.3 acres (4.2 percent) of Riparian Woodland habitat type would be removed during construction of the Proposed Action compared to 251 acres created by the Proposed Action resulting in a net increase of 237.7 acres (increase of 75 percent). Construction of the Existing Channel Enhancement Alternative would remove 37.6 acres (11.9 percent) of Riparian Woodland but would create 142 acres, for a net increase of 104 acres (33 percent). New cottonwoods would be planted, and natural cottonwood regeneration would occur on the floodplain. These trees would take about 15 to 30 years to reach a height and size comparable to those removed. However, cottonwood recruitment would occur incrementally over a number of overbank flood cycles, resulting in a riparian zone of greater abundance and diversity of various heights and stages of development rather than a strip of vegetation that is similar in age and development as currently exists. Creation of a successional riparian zone would produce a complex riparian zone with diverse wildlife habitats almost immediately upon completion of construction.

Migratory birds would be affected by the PRRP. Under the Proposed Action, it is estimated that 121 birds would be removed from the population habitat losses during construction, a reduction in population of about four percent. Following construction, the Proposed Action would lead to an increase of 2,640 birds as habitat develops, an increase of 94 percent over baseline. Under the Existing Channel Alternative, construction would cause a loss of habitat for 232 birds (8 percent loss). Following construction, an increase of 1,328 birds (an increase of 47 percent over baseline) is expected to occur. The Instream Structures Alternative would not have a major effect on bird habitat or populations.

S.5.5 Threatened and Endangered Species

Question: What impacts would the Proposed Action and alternatives have on spotted frogs, Ute ladies'-tresses and bald eagles?

Impact Analysis: None of the PRRP Alternatives will have significant adverse impacts on any threatened, endangered or candidate species. The Proposed Action would temporarily disturb 24.3

acres of spotted frog habitat during construction, which would be restored by Standard Operating Procedures. It would permanently remove 62.3 acres of spotted frog habitat, which would be offset by creation and enhancement of 90.4 acres of open water, emergent marsh and wet meadow by restoring natural functions to the riparian corridor. Ponds would be constructed in Reaches 7 and 9 to replace and expand potential overwintering habitats that would be impacted by the Proposed Action. The Existing Channel Modification Alternative would temporarily disturb 100.9 acres of spotted frog habitat, which would be restored by Standard Operating Procedures. This alternative would permanently remove 22.9 acres of spotted frog habitat. Conservation measures would be used to avoid taking of this species during construction. A long-term monitoring plan is proposed to monitor potential indirect impacts of the Proposed Action.

The Proposed Action and Existing Channel Modification Alternative would fully replace potential Ute ladies'-tresses habitat that would be removed during construction. The Proposed Action and Existing Channel Modification Alternative would have long-term beneficial effects on Ute ladies'-tresses habitat because of the development of a floodplain with periodic scouring and sediment deposition.

The Proposed Action would increase the habitat for peregrine falcon prey, and bald eagles would benefit from increased trout populations and more roosting habitat.

The U.S. Fish and Wildlife Service has determined that the Proposed Action is not likely to adversely affect any threatened or endangered species.

S.5.6 Agriculture

Issues: What are the impacts on livestock grazing and production and crop production?

Response: The Proposed Action and Existing Channel Modification Alternative would decrease grazing land and irrigated pasture animal unit months (AUM). The Proposed Action would cause a loss of 1,916 AUMs annually. The Existing Channel Modification Alternative would cause a loss of 52 AUMs annually. While related impacts on farm revenue would be minor from a local perspective, the economic impacts on individual operations could be more significant.

The Proposed Action and Existing Channel Modification Alternative would cause temporary and permanent impacts on agricultural land along the Provo River. The amount of land affected by the Proposed Action would be much larger, and thus the production losses during and after construction would be higher. Pasture and grazing land production along the river corridor would be reduced by 79.7 percent under the Proposed Action. This reduction represents only 1 percent of the total irrigated acreage in Heber Valley. The corresponding reduction in production along the river corridor for the Existing Channel Modification Alternative would be 2.2 percent. The Instream Structures Alternative would cause a very small reduction in production during construction (0.2 percent) and no impacts after construction.

Question: Would land reclaimed by filling the old river channel under the Proposed Action be covered with sufficient topsoil to conduct farming activities? Could this reclaimed land be used by farmers and ranchers with adjacent property?

Impact Analysis: Under the Proposed Action, the old river channel will be retained in fee title ownership by the federal government. Abandoned channel segments may be filled and recontoured to floodplain elevations, but most segments would be retained as side channel or wetland features in the Core Area. The other alternatives would not result in segments of abandoned river channels.

Question: What impacts would the PRRP have on farming operations that would be divided by the Proposed Action? How would irrigation water be provided to both sides of the river where a farm is presently on one side of the river? What impacts would the PRRP have on land owner access to farms divided by the Proposed Action? Would river crossings be provided to access divided farmlands?

Impact Analysis: Even without implementation of PRRP, impacts to farming operations would occur under baseline conditions as a result of the acquisition and establishment of a fee-title public access corridor required under previous Federal actions. The Proposed Action would increase the number and extent of farming operations divided by the realigned river. Crossings of the river corridor such as bridges generally would not be provided.

However, where no feasible alternate access exists or could not reasonably be developed, landowners would be provided alternate access to divided properties via bridge-type facilities or else landowners would be compensated for the loss or disruption of access. The impacts to farming operations under the Proposed Action by virtue of increased or altered travel routes to access the properties would be negotiated on a case-by-case basis as part of the compensation due to the landowners. No additional impacts of dividing farms beyond those expected to occur under baseline conditions would occur under the Existing Channel Modification Alternative or the Instream Structures Alternative. Irrigation facilities such as canals and diversions would be restored or replaced as part of the Proposed Action or the Existing Channel Modification Alternative. Water deliveries would be assured in quantity and reliability as previously existed.

Question: What impacts would occur on livestock crossing and watering on private land under the PRRP?

Impact Analysis: Impacts on agricultural operations such as livestock watering and river crossings would occur under baseline conditions even without implementation of the PRRP. However, the Proposed Action would increase the frequency and magnitude of those impacts more than the alternatives. Crossings of the river corridor by livestock would generally not be allowed except through or over existing bridges. Bridge-type crossings may be provided if no practicable alternate access exists or can be developed, or the lack of access would be compensated for during the negotiations for property acquisition with landowners on a case-by-case basis. Presently, few livestock operations exist that require crossing the Provo River on a frequent basis. Access to the Provo River for watering or development of alternative off-stream watering sources would be provided as negotiated with landowners on a case-by-case basis according to individual circumstances and needs.

Question: What would be the impacts of restrictions on motorized equipment crossing the river, and how would these impacts be mitigated to accommodate existing access by farmers and ranchers?

Impact Analysis: This is also an impact that will occur under baseline. The Proposed Action would increase the area within which motorized equipment generally would not be allowed. As previously discussed, exceptions may be negotiated on a case-by-case basis, and could involve either existing bridges or bridge-type facilities.

Question: How would increased public access along the river affect farming activities?

Impact Analysis: The public access to the river corridor would be provided under baseline conditions, even without implementation of the PRRP project. Increased use of the Project Area would occur under each of the alternatives. Impacts of the increased recreation use would be reduced by management actions to provide parking, trash pick-up and sanitary facilities. Access will be pedestrian only, and fencing of the Project Area will limit trespassing onto adjacent property.

Question: What impacts would improvement of threatened and endangered species habitats along the river have on future agricultural uses?

Impact Analysis: No impact on agricultural uses is expected, because Ute ladies' tresses habitat occurs within the active floodplain of the Provo River which will be acquired under baseline or the action alternatives, and is in areas where agricultural uses currently do not occur. The bald eagle is a winter resident and/or migrant in the Project Area. Implement of habitat for Ute ladies'-tresses and bald eagle would occur under the Proposed Action and the Existing Channel Modification Alternative. Increase in bald eagle roosting habitat would occur through expansion of the riparian cottonwood forest and increases in the fish food base. Because bald eagles will be in the Project Area at a time when agriculture use is at a minimum, the increases in roosting habitat would not impact agricultural uses beyond what may have occurred without the project. The Proposed Action would increase potential foraging habitat for peregrine falcon; however the peregrine has not been recorded in Heber Valley or in the Project Area in the recent past.

S.5.7 Socioeconomics

Question: What social, emotional and economic impacts would occur to property owners along the river from people trespassing, potential loss of private land by acquisition, providing public access,

and an influx of people pursuing recreational activities?

Impact Analysis: Fencing of the public access corridor will occur under baseline conditions and should limit the amount of trespass. Additionally the Mitigation Commission is proposing to develop an operating agreement with Wasatch County and the Division of Wildlife Resources that would identify the entity responsible for handling trespass matters. The concern over the potential loss of private land by acquisition has been addressed by modifying the Proposed Action to distinguish between land essential to the Proposed Action (Core Area) and the land that would enhance the Proposed Action (Expanded Restoration Area). Lands that fall into the Expanded Restoration Area (only applicable to the Proposed Action) would be acquired on a willing seller basis only. While the impacts from trespass and selling of private land can be reduced they will not be eliminated. The impact will depend on the attitude of the individual property owner. Unwilling sellers will resent imposition and control by others on their property rights and their sense of independence. Other property owners may benefit from increased property values and be willing sellers.

Question: How would the county tax base be affected by converting agricultural lands to a more sinuous river channel?

Impact Analysis: Construction of the Proposed Action, Existing Channel Modification or Instream Structures Alternatives would all result in an overall increase in tax revenues collected by the Wasatch County. Sales tax revenues would increase by about $30,341 annually after construction of the Proposed Action as anglers spend money on food, gasoline and other retail goods. Under the Proposed Action, there would be a small decrease in property tax revenues collected by Wasatch County. The lands to be acquired are eligible for valuation under the Farmland Assessment Act (Green Belt Taxes) and the estimated property tax revenues that would not be collected as a result of land acquisition is approximately $1,615. Wasatch County would be eligible for Federal Payments-In-Lieu-of-Taxes (PILT) for lands acquired of approximately $756 per year. Therefore, the net decrease in property tax revenue would be about $878. A separate and minor increase in property tax revenues could occur if the amenities of the Proposed Action increase property values along the Provo River.

The net increase in taxes collected by the County under the Proposed Action is estimated to be $29,482.

Similar changes in property tax and sales tax collections would occur under the Existing Channel Modification Alternative but to smaller magnitude. The net increase in taxes collected by the County under the Existing Channel Modification Alternative would be $9,658. Under the Instream Structures Alternative there would be no change in property taxes collected. Sales tax revenues would increase by $3,899.

Question: What economic impacts would be incurred by private land owners along the river from acquisition of land for the Proposed Action and alternatives?

Impact Analysis: Private landowners will be compensated at current fair market value for the lands acquired. The acquisition of lands could change production costs for some farmers if irrigation systems need to be modified, transportation routes changed or cultivation practices need to be modified. The specific impacts on individual farm enterprises would vary, are difficult to measure and were not defined in this analysis. The Standard Operating Procedures (SOPs) described in Section 1.9.6.1 of Chapter 1 would help avoid adverse production cost impacts on individual farmers and land owners. Most modifications and repairs would be completed by the project during construction, or landowners would be compensated for impacts caused by the project.

Question: What probable economic impacts would new recreation and resources users have on Heber Valley?

Impact Analysis: Construction of the Proposed Action, Existing Channel Modification or Instream Structures Alternatives would increase gross revenue, income and employment in Wasatch County. During construction, the Proposed Action would cause an annual decrease of about $13,419 in agriculture revenue. This loss would be offset by an annual increase in revenue of about $2,435,566 in other sectors of the local economy as construction equipment, materials, supplies and lands are purchased for the construction project. After construction, revenue in all sectors of the Wasatch County economy would increase by about $914,722 a year as anglers spend money in the valley on food,

gasoline and other retail goods. Earnings would increase by approximately $241,962 per year supporting about 19 new jobs (these after-construction increases are less than one percent over baseline conditions). The Existing Channel Modification Alternative would increase total Wasatch County revenue by about $1,671,936 per year during construction. After construction, revenue in all sectors of the Wasatch County economy would increase by about $399,420. Earnings would increase by approximately $109,449 per year supporting about 8 new jobs (these after-construction increases are less than one percent over baseline conditions). The Instream Structures Alternative would increase total Wasatch County revenue by about $109,887 per year during construction. After construction, revenue in all sectors of the Wasatch County economy would increase by about $377,691. Earnings would increase by approximately $110,718 per year supporting about 9 new jobs (these increases are less than one percent over baseline conditions).

S.5.8 Recreation Resources

Question: What would be the recreational capacity of the river under the PRRP?

Impact Analysis: Recreational opportunities would increase significantly over baseline conditions along the Provo River under the Proposed Action and Existing Channel Modification and Instream Structures Alternatives because of the increases in trout production. The baseline facilities and acquisition of public access would be used by more anglers than under baseline. The Proposed Action would increase recreational fishing by 96,020 angler days a year, or 481 percent. The Existing Channel Modification Alternative would increase recreational fishing by 30,102 angler days a year, or 151 percent. The Instream Structures Alternative would increase recreational fishing by 11,715 angler days per year, or 59 percent.

Question: What impacts would increased recreational use by fishermen, hikers, bikers, joggers and others have on highly sensitive areas along the river?

Impact Analysis: Increased use of the public access corridor as a result of improved fish and wildlife populations could impact some resources. However, the corridor will be managed for pedestrian and some wheelchair access only. Motorized vehicles and other wheeled vehicles (e.g. bicycles and skateboards) and horseback riding will not be allowed. The Mitigation Commission proposes to develop an operating agreement(s) with Wasatch County and the Utah Division of Wildlife Resources and possibly other appropriate entities for management of the corridor in order to assure that recreation in the corridor is managed to protect highly sensitive areas along the river. Other measures to reduce impacts such as parking areas and trash pickup are described in Section 1.4.2 of the FEIS. These management actions would occur under baseline, and would be adjusted or increased as needed under the Proposed Action or Alternatives.

S.6 Issues to be Resolved

This section defines issues that need to be resolved.

S.6.1 Wetlands

Wetlands temporarily impacted by the Proposed Action and Alternatives would be restored by Standard Operating Procedures. The Wetlands analysis also concluded that the amount and quality of riparian wetlands created by the Proposed Action and Existing Channel Modification Alternative would be greater than those affected along the Provo River. Therefore, mitigation has not been proposed for these impacts. Mitigation has been proposed for impacts on USBR mitigation wetlands and wet meadow wetlands. The conclusions of the wetlands analysis need to be reviewed and approved by the reviewing agencies, especially the U.S. Army Corps of Engineers and U.S. Environmental Protection Agency.

Following a Record of Decision on the PRRP and following final design of the selected action, a 404 Permit application will be developed and filed with the U.S. Army Corps of Engineers and, if required, similar applications will be filed with the State of Utah for stream channel alterations.

S.7 Summary of Chapter 4 — Consultation and Coordination

The Mitigation Commission and, prior to its formation, the Central Utah Water Conservancy

District conducted extensive consultation and coordination while preparing this EIS and performed related environmental and planning studies. Pre-scoping and scoping consultations were held with the public, agencies and organizations. Less formal consultations with agencies, organizations and technical experts took place throughout the preparation of the EIS.

S.7.1 Development of The Draft EIS

The EIS scoping process included consultations with 29 agencies and organizations as well as 260 members of the general public. The concerns voiced by people at district workshops were incorporated into the Preliminary Planning Report in February 1993. Additional comments received at scoping meetings in February 1993 and in March 1994 and others received in writing after the meetings were analyzed and used to finalize the alternatives and scope of the EIS. A Scoping Summary Report (CUWCD 1995) identified the following resource topics as the most important to the public, agencies and organizations that participated in scoping: agriculture, surface water, socioeconomics, wildlife resources, aquatic resources, wetlands and recreation. Resource topics identified as moderately important included threatened and endangered species, water quality, groundwater and health and safety.

Additional technical consultation and coordination occurred during the preparation of the EIS, and early planning studies. The following committees provided valuable input and helped reach important decisions:

- Provo River Restoration Project Technical Advisory Committee (composed of 26 agencies, organizations and invited technical experts)
- Provo/Wasatch Planning Coordination Committee (composed of 18 agencies and organizations)
- Fishery Technical Committee (composed of 16 agencies and organizations)
- Wetlands Technical Committee (composed of 19 agencies and organizations)
- Water Quality Technical Committee (composed of 9 agencies and organizations)
- Spotted Frog Advisory Team (composed of 3 agencies and 5 other specialists)

A Design Criteria Workshop was held in July 1993. A key component of this workshop was a tour of the Project Area with landowners. All affected landowners were invited to attend portions of the workshop and were given the opportunity to discuss their concerns directly with the project design team and the PRRP Technical Advisory Committee.

Draft work plans prepared for each resource topic addressed in the EIS were reviewed by 11 agencies and organizations and their comments incorporated into final work plans distributed in July and August 1994. Chapter 1 of the Preliminary Draft Environmental Impact Statement was distributed to 14 agencies and organizations in July 1995 for early review and comment so they and their representatives would better understand the Proposed Action and alternatives as they reviewed the EIS technical reports. Draft EIS technical reports were distributed to 11 agencies and organizations for comments, and meetings were held to receive verbal comments. These meetings were held in October, November and December 1995 and additional comments were received in writing after the meetings.

S.7.2 Review of the Draft EIS

The Fish and Wildlife Service has been involved in continuous consultation regarding the PRRP in accordance with the Fish and Wildlife Coordination Act. Comments on the Draft EIS resulted in some changes to the Proposed Action and Alternatives in the FEIS. The PRRP will incorporate all applicable recommendations of the Fish and Wildlife Service as Environmental Commitments (listed in Appendix D) The Fish and Wildlife Service has issued a Draft Biological Opinion on the PRRP based on the Draft Biological Assessment submitted for review and comment. A Final Biological Opinion is expected following review of the FEIS.

Approximately 500 copies of the Draft EIS were distributed by mail to various individuals, organizations and governmental agencies. During the 60-day public comment period (June 10, 1996 to August 13, 1996) the Mitigation Commission conducted two formal public hearings in Salt Lake and Heber City to solicit public comment on the DEIS. In addition to the testimony received at the

public hearings, the Mitigation Commission received a total of 26 letters. Chapter 4 of the FEIS contains responses to both written comments, and verbal comments received at the public hearings. See Section 4.5.2 for responses to the written comments and Section 4.5.3 for responses to the verbal comments.

S.8 Implementation Program

This FEIS represents a critical point in the development and implementation of the PRRP. Steps leading up to this FEIS were summarized in Section S.7. Following review of the Final EIS, the Mitigation Commission will issue a Record of Decision to select which of the Alternatives to implement. Several other steps then will be initiated to bring the PRRP to fruition, including:

- Final Design
- Permitting (Section 404 (wetlands), Section 401 (water quality))
- Finalize and Implement Operating Agreement/Management Plan
- Land Acquisition
- Construction
- Monitoring and Maintenance

Table 1-18 in Chapter 1 of the FEIS describes the various permits, approvals or agreements that may be needed prior to implementation of the PRRP, depending on which Alternative is selected through the Record of Decision process.

Provo River
Restoration Project

CHAPTER 1

Descriptions of the Proposed Action and Alternatives

Final Environmental Impact Statement

Chapter 1
Description of the Proposed Action and Alternatives

1.1 Introduction

The Provo River Restoration Project (PRRP) is a proposal to make modifications to the shape, slope and alignment of the Provo River between Jordanelle Dam and Deer Creek Reservoir (Project Area). The objective of the modifications is to create a more naturally functioning river system, and thereby enhance biological productivity and diversity of the fish habitat, riparian, and other environmental resources in the Project Area. Public access would be provided to the enhanced fishery and natural area.

The primary purpose of Chapter 1 is to define the PRRP Proposed Action and alternatives. This chapter also defines the purpose of and need for the project and provides other background information. The PRRP Environmental Impact Statement (EIS) analyzes three alternatives that fulfill to varying degrees the Utah Reclamation Mitigation and Conservation Commission's (Mitigation Commission's) obligations under the Central Utah Project Completion Act (CUPCA) to improve, rehabilitate and restore the fish and riparian habitats of the Provo River between Jordanelle Dam and Deer Creek Reservoir. Decision-making authority regarding a Proposed Action and specific project elements of the PRRP resides with the Mitigation Commission and the Department of the Interior, Central Utah Project Completion Office, joint-lead agencies for this EIS. The PRRP EIS has been prepared based upon feasibility level designs of the Proposed Action and alternatives.

The material presented in this chapter describing the Proposed Action (Riverine Habitat Restoration) (referred to in the PRRP Technical Report (CUWCD 1994) as the Maximum Practical Restoration Alternative) and the Existing Channel Modification Alternative (referred to in the PRRP Technical Report (CUWCD 1994) as the Existing Channel Enhancement Alternative) has been prepared and summarized from the Provo River Restoration Project Technical Report — Description of Proposed Alternatives (CUWCD 1994). This report is available upon request from: Chad Gourley, Project Coordinator, Utah Reclamation Mitigation and Conservation Commission, 102 West 500 South, #315, Salt Lake City, Utah 84101. The description of the Instream Structures Alternative was summarized from the Aquatic Habitat Improvement Plan for the Provo River below Jordanelle Dam, Utah (Clearwater BioStudies, Inc. 1991). A summary of the Instream Structures Alternative is presented in the PRRP Technical Report (CUWCD 1994).

The PRRP Technical Report (CUWCD 1994) was sponsored by Central Utah Water Conservancy District (CUWCD) under the Provo River/Utah Lake Special Studies Program. Funding was provided by the U.S. Bureau of Reclamation (USBR) as part of its mitigation responsibilities prior to the establishment of the Mitigation Commission.

1.1.1 History and Background

1.1.1.1 The Source of Mitigation Obligations

The PRRP was designed to help mitigate the fish, wildlife and environmental impacts of the Bonneville Unit of the Central Utah Project (CUP) and the Provo River Project. The Bonneville Unit is the largest unit of the CUP. It consists of six interrelated systems: the Starvation Collection System; Ute Indian Tribal Development activities; the Strawberry Aqueduct and Collection System; the Municipal and Industrial System; the Diamond Fork System; and the Spanish Fork Canyon-Nephi Irrigation System (SFN).

The Strawberry Aqueduct and Collection System (SACS) is a key component of the Bonneville Unit. It develops the water supply out of the Duchesne River system in the Colorado River Basin for delivery to the Bonneville Basin. Under full operation, the Bonneville Unit would deliver about 102,000 acre-feet of water to the Wasatch Front in an average year. The water supply is developed by a series of reservoirs, on-stream diversions, and a 37-mile long aqueduct connecting Upper Stillwater Reservoir, located on Rock Creek, to Strawberry Reservoir (enlarged by Soldier Creek Dam). Along its course, the SACS aqueduct intercepts water from

a total of ten streams (Rock Creek, South Fork Rock Creek, Hades Creek, Twin Creek, Wolf Creek, West Fork Duchesne River, Currant Creek, Water Hollow Creek, Layout Creek, and Strawberry River). Six streams are completely dewatered by SACS, and stream flows are reduced on the four remaining impacted streams. Several miles of streams were inundated by construction of Upper Stillwater Dam, Currant Creek Dam and enlargement of Strawberry Reservoir. Construction and operation of these CUP features caused extensive impacts to aquatic resources.

The U.S. Fish and Wildlife Service developed a plan to mitigate for those impacts in cooperation with other state, federal and local entities. The 1988 Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System (FWS 1988) provided specific recommendations for fish habitat improvement measures on 119 miles of streams, including the 10-mile reach of the Provo River between Jordanelle Dam and Deer Creek Reservoir. These improvements were to be made only on streams with public access and where activities or forces that have destabilized streambanks and limited fish habitat have been controlled. The baseline conditions (see Section 1.3 and Section 1.4) for the Provo River partially satisfy these conditions by including the acquisition of public angler access to and along the river and by providing minimum instream flows of 125 cfs. Prior to baseline, reaches of the Provo River had been dewatered during the irrigation season, which eliminated fish habitat during those times. A plan to implement fish habitat improvements also was developed (the Instream Structures Alternative in this EIS) but this plan was never implemented nor was it analyzed under the National Environmental Policy Act (NEPA).

The Municipal and Industrial System consists of Jordanelle Reservoir; the Jordan Aqueduct (which delivers water from the lower Provo River at Olmstead Diversion to Salt Lake County for municipal uses); and the Alpine Aqueduct (which diverts water from the same location for municipal uses in Utah County). Construction of Jordanelle Reservoir inundated several miles of the Provo River, including 630 acres of riparian habitat. The U.S. Bureau of Reclamation, which constructed Jordanelle Dam, committed to maintain a continuous minimum instream flow in the Provo River between Jordanelle Dam and Deer Creek Reservoir as a mitigation measure for impacts of the project (see Section 1.3). The consolidated Wildlife Mitigation Plan for the Strawberry Aqueduct and Collection System, Municipal and Industrial System and Diamond Fork System of the Bonneville Unit (FWS 1987) identified a comprehensive mitigation program for terrestrial impacts of the Bonneville Unit, including riparian habitats. Riparian losses of the Municipal and Industrial System were 630 acres. To date, only 402 acres have been mitigated through off-site compensation on the Strawberry River below Soldier Creek Dam and on Rock Creek near the U.S. Forest Service boundary. Riparian losses of 228 acres remain to be mitigated for the Municipal and Industrial System.

Prior to passage of CUPCA, mitigation measures implemented to partially satisfy the outstanding mitigation measures discussed above have included angler access and stream habitat improvement projects on numerous streams in the Bonneville Unit area, including Rock Creek, South Fork Rock Creek, North Fork Duchesne River, West Fork Duchesne River, Duchesne River (main stem), Strawberry River upstream of Strawberry Reservoir, Strawberry River between Strawberry Reservoir and Starvation Reservoir, and Strawberry River downstream of Starvation Reservoir, Currant Creek, and Diamond Fork Creek.

The PRRP is also being undertaken pursuant to the general authority of the Secretary of the Interior to manage and correct the problems arising from any reclamation project constructed and operated under his purview. The Provo River Project, authorized by Congress in the National Industrial Recovery Act of 1933, and specifically the Provo River Channel Revision component of the project initiated in the 1950s, has damaged public fish, wildlife and recreation resources of the Provo River between the outlet of the Duchesne Tunnel and Deer Creek Dam. Prior to initiation of construction of the Provo River Project in the 1940s, no Fish and Wildlife Coordination Act report was prepared and no systematic evaluation of the anticipated environmental impacts were completed. Thus, no mitigation obligations were attached to the project. The Secretary of the Interior, as a joint lead agency in the preparation of the PRRP plan and Environmental Impact Statement, has determined that: (1) the Provo River Project has damaged the aquatic and riparian habitat along the Provo River; (2) the Provo River Project has an obligation to mitigate the environmental impacts it has caused; and (3) the PRRP is ideally planned and located to

redress the environmental impacts of the Provo River Project.

1.1.1.2 Mitigation Commission

CUPCA (Public Law 102-575) created the Mitigation Commission to coordinate implementation of fish, wildlife and recreation mitigation and conservation measures for the Central Utah Project (CUP) and other federal reclamation projects in Utah. CUPCA specifically directs the Mitigation Commission to implement, on a priority basis, unfulfilled mitigation commitments of past CUP decision documents, most of which are identified in the 1988 Definite Plan Report for the Bonneville Unit of the CUP (USBR 1988) or specifically required by other mitigation plans and commitments. CUPCA provides further guidance regarding standards that the Mitigation Commission must consider and apply while developing its five-year Mitigation and Conservation Plan. Ecosystem restoration is one of the standards the Commission was directed to apply in implementing mitigation and conservation projects. Specifically, Section 301(g)(4)(A) of CUPCA provides the following:

"(A) restore, maintain, or enhance the biological productivity and diversity of natural ecosystems within the State which have substantial potential for providing fish, wildlife, and recreation mitigation and conservation opportunities."

By enacting CUPCA in 1992, the U.S. Congress reaffirmed the commitment of the federal government to mitigate impacts on fish, wildlife and recreation resources in Utah caused by construction and operation of the CUP and other federal reclamation projects in Utah. While substantial progress has been made throughout the Uinta Basin and Bonneville Basin, substantial mitigation remains to be completed. The Mitigation Commission and the Department of the Interior have determined that funding authorized pursuant to CUPCA should be utilized not only to complete the mitigation obligations of the Bonneville Unit of CUP, but can concurrently and economically address some problems recognized as mitigation obligations associated with the Provo River Project.

1.1.1.3 Why the Middle Provo River was Chosen

Historical photographs show that a broad area of dense riparian vegetation (cottonwoods, willows, etc.) once dominated Heber Valley, extending over a width of 1,000 feet or more. This riparian corridor was supported by the Provo River migrating back and forth across its flood plain in response to natural forces. Today that corridor is limited to less than 200 feet in many locations. Reductions of fish, birds and other wildlife occurred commensurate with the reduction of the riparian habitat.

The current character of the river is primarily the result of human influences during the past 100 years. These influences are associated with the following activities:

- Transbasin diversions to the Provo River watershed from the Weber River and Duchesne River basins (imported water greatly increases the flow and erosion potential in the river during high runoff and flood periods)
- The Provo River Project, a USBR project constructed in the 1940s and 1950s prior to CUP, drastically altered the Provo River both upstream and downstream of the present Jordanelle Reservoir by implementing the Provo River Channel Revision Project. The channelization, dredging and construction of dikes along the majority of the study reach to control flooding and channel migration resulted in a straightened and confined channel that has little habitat diversity, and the bottom has downcut in some locations from erosion
- Construction of hard sills or dams at points of irrigation diversions (these cause the channel to widen upstream and downcut immediately downstream)
- Diversion of channel flows to satisfy irrigation water rights (these diversions completely dewatered portions of the channel during parts of the year prior to baseline conditions in 1996)
- Clearing and filling of abandoned floodplain areas for agriculture, grazing and municipal development

The PRRP has evolved from efforts over the past several years by federal and state agencies, including the Central Utah Water Conservancy District (CUWCD) and more recently the Mitigation Commission, to investigate approaches to accomplish the various mitigation requirements that would satisfy the Commission's "ecosystem restoration" mandate from Congress. Satisfaction of mitigation requirements and the Commission's ecosystem restoration mandate could both be satisfied through a project that focused on improving the overall value of the Provo River corridor from Jordanelle Dam to Deer Creek Reservoir for fish and wildlife and ecosystem function.

The PRRP does not address all remaining mitigation requirements for the construction and operation of the CUP. A thorough review of the status of mitigation requirements of the Bonneville Unit is contained in Chapter 3 of the 1997 Mitigation and Conservation Plan (Mitigation Commission 1997a).

1.2 Purpose and Need

This section describes the needs and purposes to which the Proposed Action and alternatives are responding. Section 1.2.1 lists the needs for the Proposed Action and alternatives and Section 1.2.2 lists their purposes.

1.2.1 Need for the Proposed Action and Alternatives

The Proposed Action and alternatives would meet the following needs:

- Meet requirements for partial mitigation of impacts caused by the Bonneville Unit of the Central Utah Project (CUP), as described in the 1988 Definite Plan Report for the Bonneville Unit of the CUP (USBR 1988), and more specifically by the 1988 Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System of the Bonneville Unit of the CUP (FWS 1988); the 1987 Wildlife Mitigation Plan for the Bonneville Unit (FWS 1987); and Title III of CUPCA (Public Law 102-575; Sections 307(1), 307(2), 309(a)(1), 309(a)(4), and 311(d)(2)).
- Mitigate impacts of the Provo River Project by taking measures to restore or improve the Provo River corridor between Jordanelle Dam and Deer Creek Reservoir to a more naturally functioning riverine ecosystem. The Provo River has been extensively modified by human activities, including impoundment, water diversions, channel straightening, dredging and diking. These actions have resulted in degradation of the natural features and functions of the riverine ecosystem, including loss of habitat for fish and wildlife, altered vegetative communities and loss of riparian forest, altered sediment transport and deposition patterns within the historic floodplain and river channel, and loss of active floodplain.

1.2.2 Purposes of the Proposed Action and Alternatives

The alternatives described in this EIS are designed to meet the needs for this project. Following are the specific purposes of the Proposed Action and alternatives:

- To help mitigate the environmental impacts of the Bonneville Unit of the CUP and the Provo River Project on riverine environments (CUPCA Section 301)
- To increase biological productivity and diversity within the Provo River ecosystem (CUPCA, Section 301(g))
- To restore or improve fish habitat in the Provo River (1988 Aquatic Mitigation Plan for SACS; CUPCA Section 307)
- To create a diversity of wetland and aquatic habitats within the Provo River corridor (CUPCA Section 301(g))
- To replace riparian habitats lost by construction of Jordanelle Dam by rehabilitating or restoring existing riparian habitats, including cottonwood galleries and wetlands (1987 Terrestrial Mitigation Plan for the Bonneville Unit; CUPCA Section 309(a))
- To provide public access to the corridor

- To accommodate a growing, statewide demand for stream-related outdoor recreation experiences (CUPCA Section 311(d))

- To manage the river corridor for these purposes

1.3 Overview of the Proposed Action and Alternatives

This section summarizes the features of the Proposed Action and alternatives. Sections 1.5 through 1.9 describe the Proposed Action and alternatives in more detail. The following presents a few terms, uniquely defined, to aid in the understanding of the alternatives.

Baseline Conditions: Even without implementation of the PRRP, changes to the existing environment of the Provo River corridor would be implemented by the federal government as a result of prior decisions and commitments made in the Final Supplement to the Final Environmental Statement for the Municipal and Industrial System (USBR 1987). These commitments would be implemented regardless of a decision to implement the PRRP Proposed Action or any of the alternatives. These commitments include the following:

- Providing seven new recreation access points along the Provo River between Jordanelle Dam and Deer Creek Reservoir including parking and restroom facilities

- Providing pedestrian access for fishing and related or compatible uses along the Provo River between Jordanelle Dam and Deer Creek Reservoir

- Fencing of the public access corridor to control trespass problems

- Managing the acquired corridor and constructed access facilities through a management agreement with a state or local entity

- Maintaining a minimum instream flow of 125 cfs in the Provo River below Jordanelle Dam

See Section 1.4 for a more complete discussion of these baseline commitments and how they would be implemented.

Core Area: Lands required to implement and manage the Proposed Action and alternatives to meet the project need.

Expanded Restoration Area: Lands adjacent to the Core Area that provide additional opportunities for habitat restoration and protection.

1.3.1 Location of the Proposed Action and Alternatives

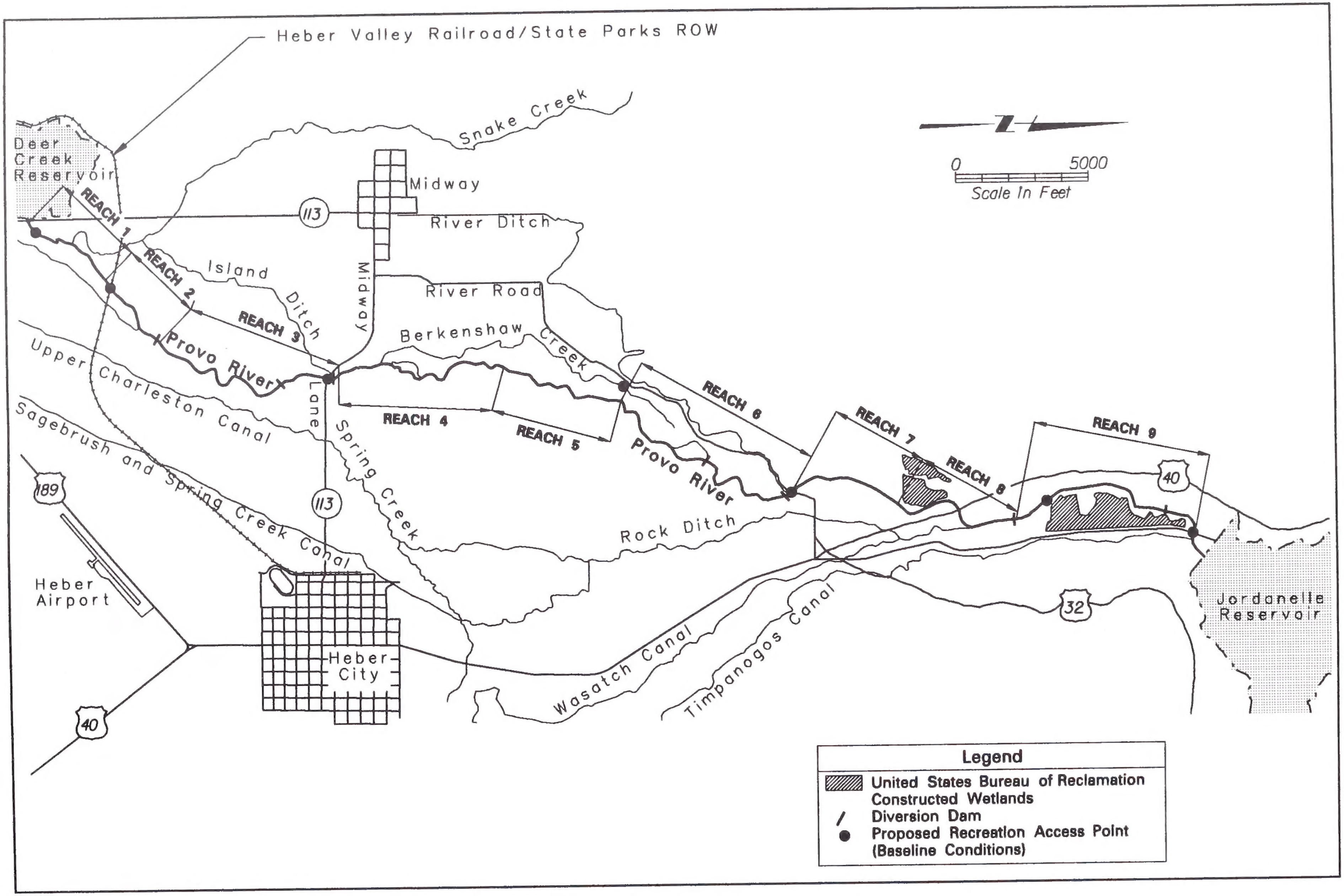
Map 1-1 illustrates the location of the Proposed Action and alternatives in Heber Valley situated between Jordanelle Dam and Deer Creek Reservoir. The Provo River flows approximately 10 miles from Jordanelle Dam at the north end of Heber Valley to Deer Creek Reservoir at the south end of the valley. The north and upstream boundary of the PRRP Project Area is the Old US Highway 40 bridge about 1,300 feet downstream of Jordanelle Dam. The south and downstream boundary of the PRRP Project Area is the State Route 113 bridge crossing the upper end of the Deer Creek Reservoir flood easement area. Elevations along this portion of the river range from 5,860 to 5,410 feet mean sea level. The east and west boundaries of the PRRP Project Area are generally within 1,000 feet of the existing river channel, and at no point exceed 1,400 feet from the present channel. Maps A-1 and A-2 in the map pocket at the back of the EIS provide more specific information about the location of the Proposed Action and alternatives.

Map 1-1 and Maps A-1 and A-2 in the map pocket at the back of the EIS show the nine reaches (river segments) into which the Provo River was divided for planning and environmental analysis purposes. Subsequent discussions of the Proposed Action and alternatives make frequent reference to the river reach designations shown on these maps.

1.3.2 The Proposed Action: Riverine Habitat Restoration

1.3.2.1 Location and Acquisition

The location of the major physical features of the Proposed Action (Riverine Habitat Restoration) are



Map 1-1
Location of the Proposed Action and Alternatives

shown on Map A-1 in the map pocket at the back of the EIS. Map A-3 in the Map Pocket at the back of the EIS shows the Project Area needed to be acquired for the Proposed Action. Two different acquisition areas are depicted. The Core Area (identified in light shading) consists of lands required to implement and manage the Proposed Action (to meet the Project Need). The Expanded Restoration Area (identified by darker shading) consists of lands that provide additional opportunities for fish and wildlife habitat development and protection. The PRRP Core Area encompasses 490 acres in addition to lands that would be acquired under baseline. The Proposed Action would require the acquisition of an additional 490 acres of private lands (see Table 1-7 in Section 1.5.3 for a detailed breakdown of land acquisition needs). Acquisition would be fee title, and would include all potential modes of acquisition. For acquiring the PRRP Core Area, eminent domain would be exercised if necessary, but only if all other feasible solutions have been unsuccessful.

The PRRP Expanded Restoration Area would add to the PRRP Core Area along some sections of the river. The Expanded Restoration Area would be acquired on a willing-seller basis only. It would provide the land necessary to construct many of the potential side channels, wetlands and ponds within the Provo River floodplain, thereby further meeting the project need and fulfilling several additional project purposes (see Section 1.2.2). The Expanded Restoration Area also was separated from the Core Area to reduce the total acreage required to meet the Project Need. It also was designed to allow the Core Area to be expanded to address the concern raised by some landowners that acquisition along the river corridor (Core Area) may create uneconomical remainder properties which landowners would not be interested in retaining. The Proposed Action includes potential acquisitions within the PRRP Expanded Restoration Area that could result in acquisition of up to 198 additional acres. The Expanded Restoration Area also would be acquired in fee title, but only on a willing-seller basis.

1.3.2.2 Channel Features

Within the Core Area, the Proposed Action would reconstruct and realign a majority of the existing river channel and floodplain system in a meandering riffle-pool sequence to recreate a naturally functioning river channel that is re-connected with its floodplain. In most locations, existing levees would be removed; however, 100-year flood protection would still be provided by the expanded floodplain or new setback levees. A meandering riffle-pool channel interacting with a functioning floodplain would be developed wherever possible. In some areas, this would be accomplished by incorporating the present channel. In others, the present channel would be abandoned and a new channel alignment developed. Where possible, the river channel would be allowed to adjust its alignment within the designed meander width in response to changing hydrologic or geomorphic factors. Disturbed areas along the new floodplain would be revegetated with indigenous species using artificial and natural means. Multiple-story riparian vegetation would be restored within the floodplain of the corridor. See Figure 1-1 for a schematic of this alternative.

1.3.2.3 Floodplain Features

Opportunities for side channels, wetlands and ponds to be constructed on either side of the new river alignment under the Proposed Action would occur throughout the length of the Provo River corridor between Jordanelle Dam and Deer Creek Reservoir. These features would be developed in the Core Area. Side channels, wetlands and ponds would also be developed within the Expanded Restoration Area. Lands in the Expanded Restoration Area would be acquired on a willing-seller basis only from cooperative landowners. These features would add significant habitat diversity to the project. The side channels would be developed as small meandering channels adjacent to the Provo River. The wetlands and ponds would be constructed in the floodplain or side channels. Pond and side channel features currently shown in the Proposed Action are conceptual. Eleven different wetland sub-types have been designed (Table 1-1). Exact numbers, locations and dimensions would be determined at the final design stage, and, within the Expanded Restoration Area, would be determined based on willingness of landowners to sell the additional lands needed to construct these features. The water sources for wetlands include diversion from the river, excavation to intercept groundwater, and connection to a spring source.

1.3.2.4 Land Management

Existing land uses such as agricultural production within the acquired Core Area and Expanded

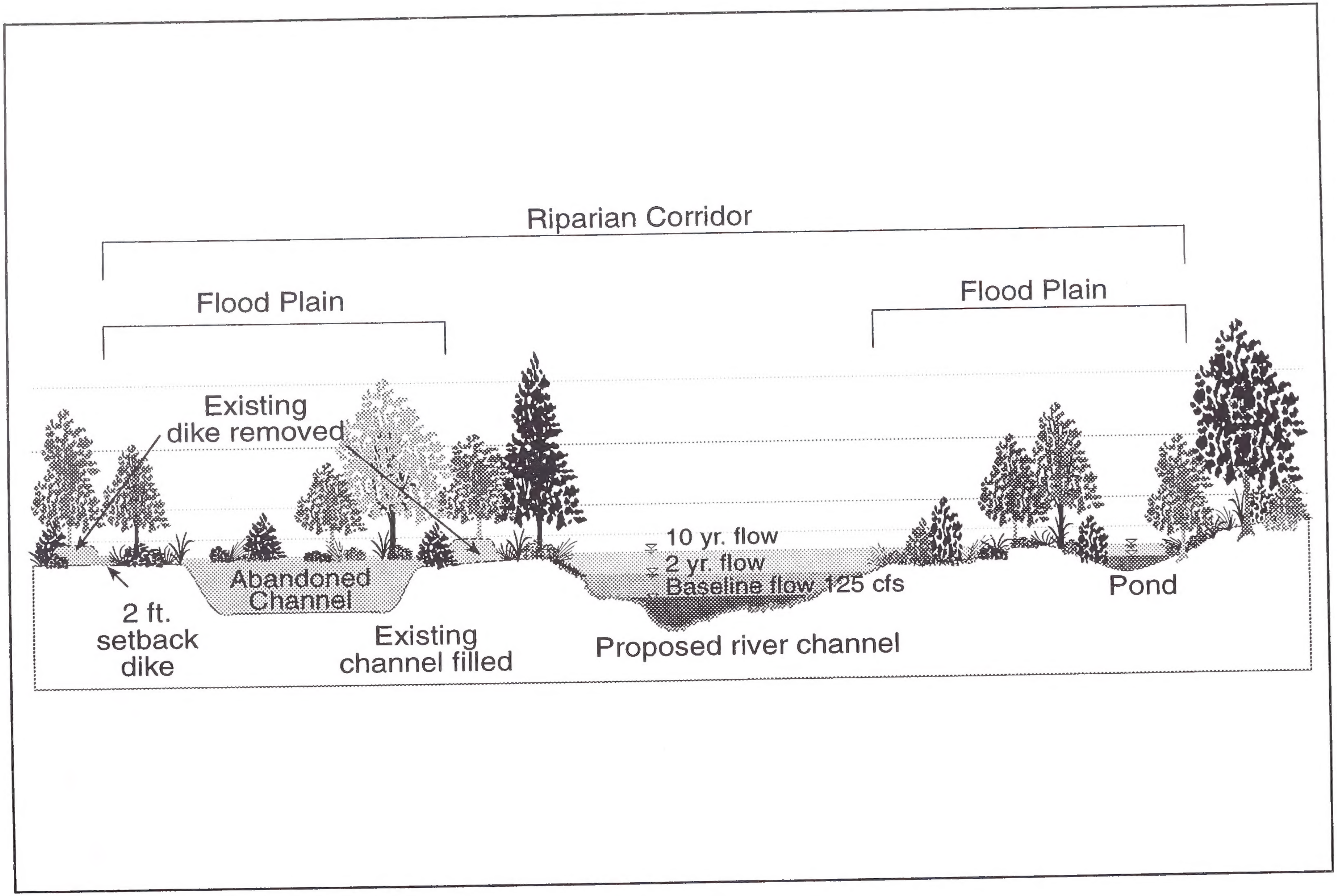


Figure 1-1
Schematic Cross-Section
Riverine Habitat Restoration

Table 1-1
Description of Eleven Wetland Subtypes to be Restored within the Proposed Action Project Area[1]

Wetland Category	Wetland Subtype	Description	Dominant Vegetation
A. Forested Wetland	1) Riparian Woodland/Upland	Transition between uplands and riparian forest. These areas usually consist of old-growth forest with an understory of upland vegetation types.	Narrowleaf cottonwood, box elder, and Kentucky bluegrass
	2) Riparian Woodland RW	Complex riparian forest with multiple story canopy. These areas typically have a cottonwood-box elder overstory with smaller riparian trees, shrubs, grasses, and forbs in the understory. These wetland types are usually located in the high floodplain or low terrace areas.	Narrowleaf cottonwood, box elder, hawthorne, alder, dogwood, willow, and Kentucky bluegrass
	3) Vernal Oxbow VO	Non-persistent ponds created in an abandoned river channel segment forming when groundwater levels rise during high spring flows. Ponding may not occur every year.	Swordleaf rush, redtop bentgrass, mosses, and Ute Ladies'-tresses orchid
	4) Riverine Ephemeral	Secondary channel associated with the active floodplain flowing when the main channel floods.	Narrowleaf cottonwood, dogwood, and willows
B. Shrub Wetland	5) Riparian Scrub/Shrub RS	Typically, willows and other water-obligate shrubs that grow in zones near the river and are usually in the active floodplain.	Dogwood, willow, horsetail, and narrowleaf cottonwood
C. Wet/Moist Meadow	6) Wet Meadow WM	Grasslands (sedge-rush dominated) with saturated soils near or at the ground surface for most of the growing season.	Nebraska sedge, woolly sedge, Baltic rush, and redtop bentgrass
D. Emergent Marsh	7) Emergent Oxbow RO	Persistent ponds created in an abandoned river channel segment. Water depth fluctuates in these ponds as river discharge changes, but standing water persists through all seasons.	Cattail, hardstem bulrush, beaked sedge, swordleaf sedge, mannagrass, and Nebraska sedge
	8) Emergent Marsh EM	Low areas where standing water persists throughout the year. The water source could be from the river, groundwater, spring, or tributary drainage.	Cattail, hardstem bulrush, beaked sedge, and bur-reed
	9) Riverine Forewater and Backwater RFW or RMW	Low areas formed at the base of a point bar on the upstream (forewater) and downstream (backwater) edges. These areas scour during flood flows and are connected to the river during the base flow period.	Pondweed, duckweed, and water smartweed

Table 1-1
Description of Eleven Wetland Subtypes to be Restored within the Proposed Action Project Area(1)

Page 2 of 2

Wetland Category	Wetland Subtype	Description	Dominant Vegetation
	10) River Vernal Pools RVP	Low areas near the center of a point bar scoured during flood flows. This wetland type is usually within the active floodplain and retains water for only part of the growing season.	Redtop bentgrass, swordleaf rush, and moss
E. Open Water	11) Riverine Perennial RP	Water flowing in the river channel throughout the year that creates a variety of hydraulic habitats.	Narrowleaf cottonwood, dogwood, and willows

Notes:
(1) Exact numbers, locations, and dimensions of these features will be determined during final design.

Restoration Area would not be continued. However, the project would be designed to accommodate related needs, such as access to the river for stock watering or construction of facilities for off-stream watering. Changes to irrigation diversions would be coordinated with landowners, canal companies, and local government officials. Water deliveries would be assured without interruption. The Proposed Action would not alter the locations of major structures, such as highway and railroad bridges or major roads.

1.3.3 Existing Channel Modification Alternative

1.3.3.1 Location and Acquisition

The location of the major physical features of the Existing Channel Modification Alternative are shown on Map A-2 in the map pocket at the back of the EIS. The Project Area for the Existing Channel Modification Alternative includes a Core Area only. This alternative would require 7.6 acres of fee title acquisition and 14.1 acres of construction easement in the Core Area beyond that acquired under baseline (see Table 1-7 in Section 1.5.3 for a detailed breakdown of land acquisition needs). There is no Expanded Restoration Area associated with this alternative.

1.3.3.2 Channel Features

The Existing Channel Modification Alternative would reconstruct the river cross-section geometry within the present channel alignment to create a functional step-pool or rapid-pool system. This alternative would attempt to stabilize the existing river channel by making channel modifications with multiple rock weirs and large boulders. It would essentially create a canyon-type stream in a valley setting. Another component of this project is that disturbed areas along the existing channel would be revegetated with indigenous species, thereby creating a limited multiple-story riparian habitat along the channel margins within the Project Area. See Figure 1-2 for a schematic of this alternative.

1.3.3.3 Floodplain Features

There are no side channels, ponds or wetlands associated with the floodplain under this alternative.

1.3.3.4 Land Management

Existing (under baseline) land uses within the acquired corridor would not be continued. However, the project would be designed to accommodate related needs, such as access to the river for stock watering or construction of facilities for off-stream watering. Changes to irrigation diversions would be coordinated with landowners, canal companies, and local government officials. Water deliveries would be assured without interruption. This alternative would not alter the locations of major structures, such as highway and railroad bridges or major roads.

1.3.4 Instream Structures Alternative

1.3.4.1 Location and Acquisition

Map 1-2 shows the locations where instream structures would be installed in the main channel under the Instream Structures Alternative. (Note: This alternative is referred to as the No Action Alternative in the PRRP Technical Report (CUWCD 1994). The Project Area for this alternative consists of the Core Area only. No additional lands would be required in the Core Area beyond those acquired under baseline (see Table 1-7 in Section 1.5.3 for a detailed breakdown of land acquisition needs). There is no Expanded Restoration Area associated with this alternative.

1.3.4.2 Channel Features

The Instream Structures Alternative would make no changes to the existing river channel geometry and elevations, but would create additional fish habitat through the installation of instream fish habitat structures at selected locations along the Provo River. Little change to riparian habitat conditions would occur under this alternative.

1.3.4.3 Floodplain Features

There are no side channels, ponds or wetlands associated with the floodplain under this alternative.

1.3.4.4 Land Management

Existing (under baseline) uses along the river corridor would be largely unaffected by this alternative.

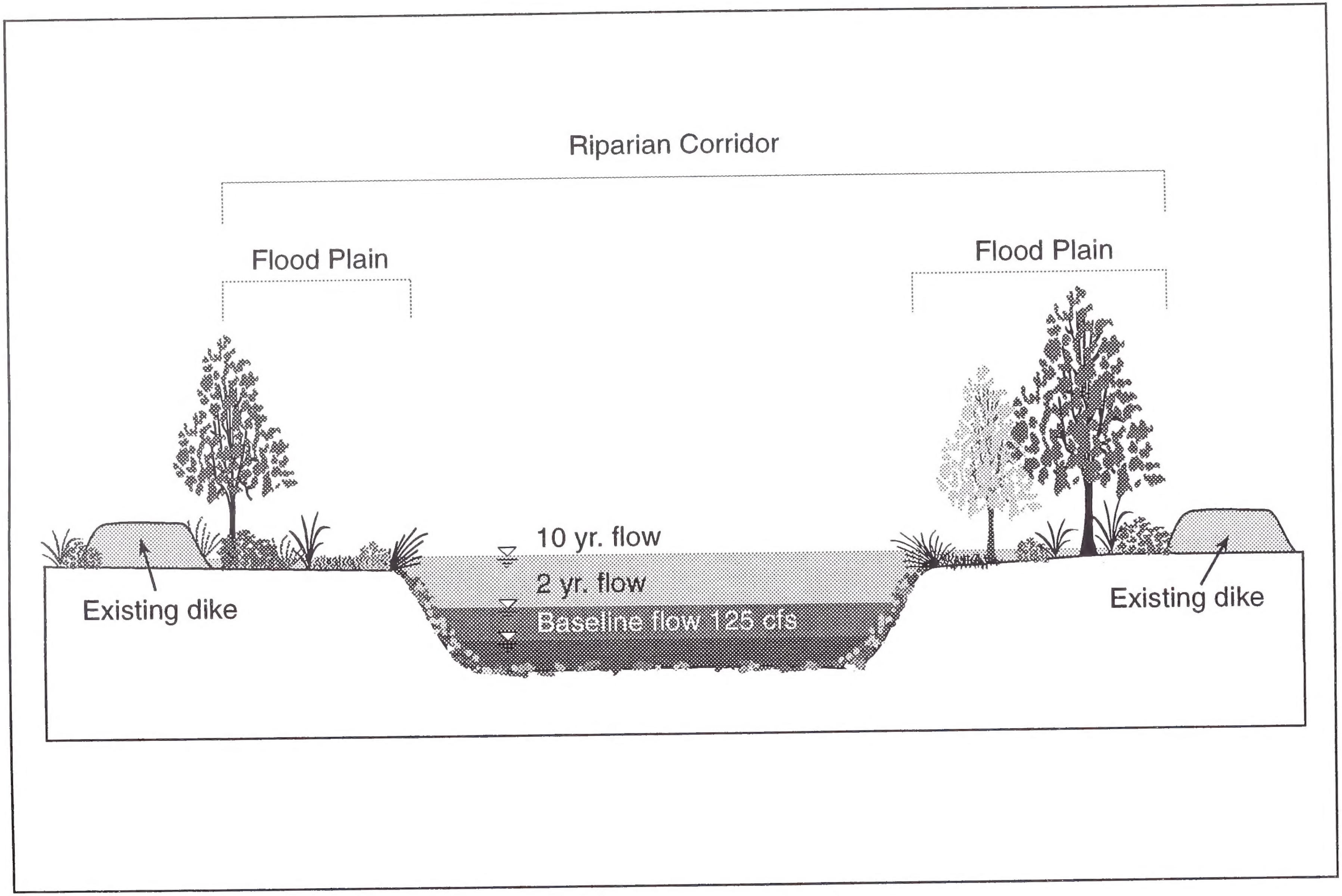
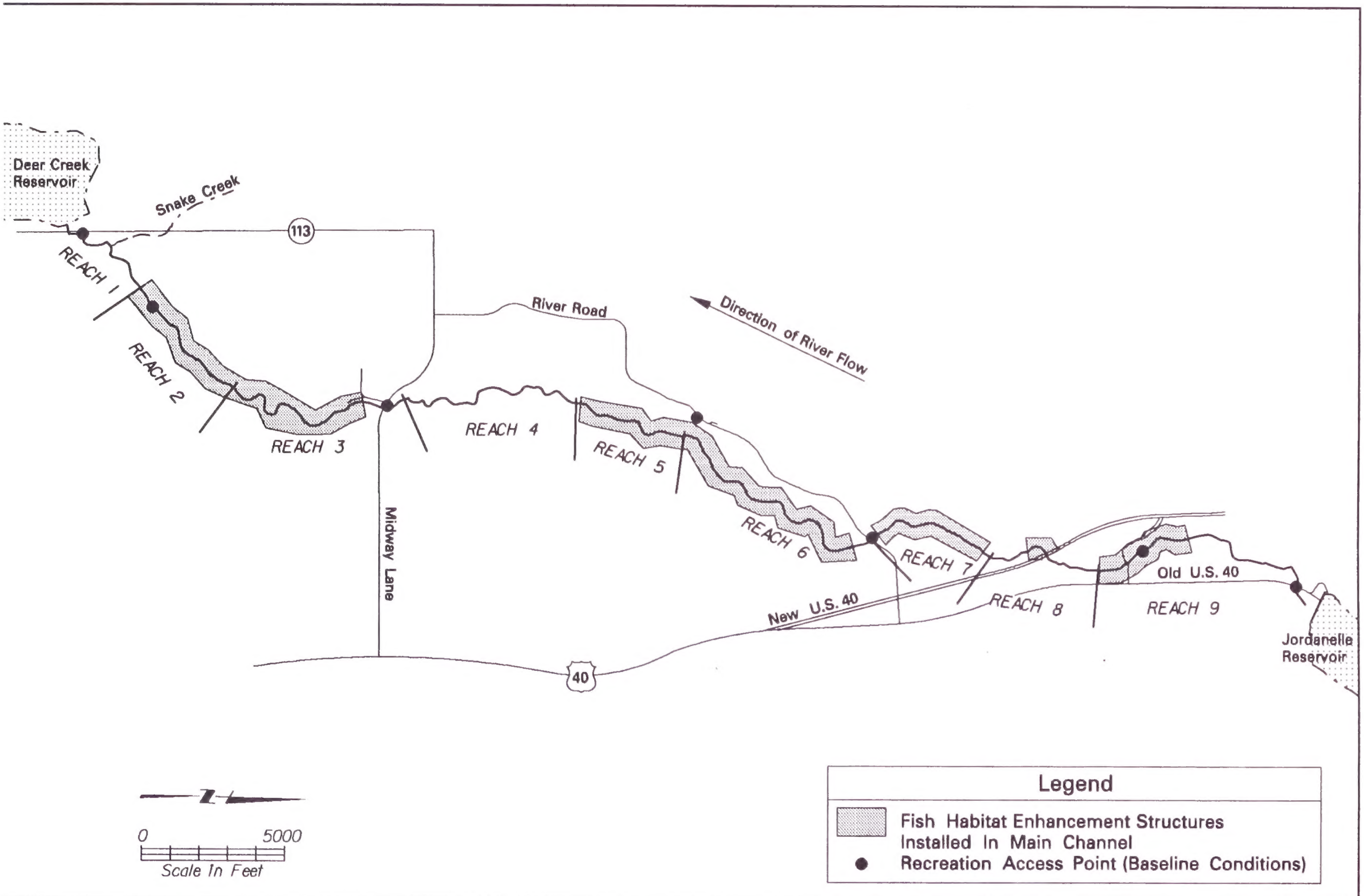


Figure 1-2
Schematic Cross-Section
Existing Channel Modification Alternative



Map 1–2
Instream Structures Alternative

1.3.5 No Action Alternative

Under this alternative, the Mitigation Commission would not meet its obligations to mitigate impacts of the CUP (see Section 1.2). The Mitigation Commission would still be required to do so. There have been no other projects capable of meeting these obligations identified that are different from the alternatives analyzed in this EIS. All baseline environmental commitments described in Section 1.3 would be implemented by the Mitigation Commission even if the No Action Alternative is selected.

1.3.5.1 Acquisition

No additional land would be needed to implement this alternative.

1.3.5.2 Channel and Floodplain Features

The No Action Alternative is the alternative of not stabilizing the river bed and banks, not restoring the riverine habitat and not improving instream fish habitat. The commitments for public access, instream flow and related purposes included in the Bonneville Unit Municipal and Industrial (M&I) System Final EIS would be implemented (See Section 1.4.1 for a detailed description of the "baseline").

1.3.5.3 Land Management

Dike and river diversion maintenance for flood control and irrigation would continue in and near the Provo River channel. Baseline uses along the river corridor would be largely unaffected by this alternative.

1.3.6 Major Differences Between the Proposed Action and Alternatives

Table 1-2 summarizes the key characteristics of the Proposed Action and PRRP alternatives. Both the Proposed Action and Existing Channel Modification Alternative would make major changes to the existing channel in order to develop a self-sustaining, functional river system. A primary difference between the two is that the Existing Channel Modification Alternative would work almost entirely within the present levee area or present channel alignment, whereas the Proposed Action would not be constrained to the present alignment. The Proposed Action would construct a meander/riffle-pool "C-type" channel and increase the length of the river by almost 2 miles. The Existing Channel Modification Alternative would construct a step-pool "B-type" channel and not increase the length of the river (channel types B- and C-types are according to the Rosgen Stream Channel Classification System and are described in Section 1.5 and Section 1.6 of this EIS and in the PRRP Technical Report (CUWCD 1994)). Another primary difference is that the Proposed Action would provide for the development of a diverse multiple-story riparian zone with cottonwood trees and other riparian vegetation sustained by periodic flooding of the constructed and re-connected floodplain. The Existing Channel Modification Alternative would have a narrow riparian zone along the river channel. It also would use setback dikes more extensively to establish future 100-year flood limits as opposed to allowing these limits to be set by natural topographic features as in the Proposed Action. Table 1-3 summarizes land acquisition requirements of the PRRP Proposed Action and alternatives.

The Instream Structures Alternative is different from the Proposed Action and Existing Channel Modification Alternative because it would not make major changes to the existing channel. This alternative would make minor changes within the existing Provo River channel through installation of fish habitat structures. These structures would be relatively short-term in comparison and require more frequent maintenance and replacement than features constructed under the other alternatives.

The Proposed Action and alternatives were formulated with the same assumed hydrology, based on proposed water releases from Jordanelle Dam (USBR 1987). This includes the 125 cfs minimum streamflow requirement as mandated in Section 303(c)(2) of CUPCA. PRRP design hydrology is summarized in the PRRP Technical Report (CUWCD 1994). Hydrologic characteristics and public access to the entire existing river corridor are assumed to be part of baseline conditions.

Table 1-2
Key Characteristics of the Proposed Action and PRRP Alternatives*

Characteristic	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Main Channel Activities	Construct 70-100 ft wide (typical) meandering riffle-pool channel.	Reconstruct 65-80 ft wide rapid-pool and step-pool channel in existing channel alignment.	Install over 200 habitat enhancement structures (logs, boulders, root wads) in 5.9 miles of river.
	Remove or breach nearly all dikes; establish 400+ ft wide floodplain.	Construct 140-180 ft wide floodplain, within existing dikes where possible, or within new setback dikes.	Make no other changes to channel system.
	Regrade channel profile to fit natural features.	Minimal adjustments to thalweg elevation, except where diversion dams are removed.	
	Restore 11.6 miles of river.	Modify 9.6 miles of river.	Enhance 5.9 miles of river.
		Remove or breach 21,500 ft of existing levee.	
	Increase existing river length by 9,430 feet.	No increase in river length.	No increase in river length.
	Remove 47,800 ft of existing levee.		

Table 1-2
Key Characteristics of the Proposed Action and PRRP Alternatives*

Characteristic	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Floodplain Activities	Construct 50,070 ft of side channels (19,340 feet in Core Area, 30,730 feet in Expanded Restoration Area); Construct five to ten floodplain ponds (12.6 acres, including construction of eight Spotted Frog habitat ponds); Raise or lower 47 acres to develop needed channel-floodplain.	None	None
Channel Stability	Excellent dynamic stability conditions because of adherence to geomorphic design for riffle-pool channels. Riffles designed to hold grade. Additional bank protection used where necessary.	Good static stability conditions through armoring of riffles and bank revetment. Attention to riffle design to hold grades and prevent excessive sediment production.	Minor, localized, short-term improvement in vertical stability. Horizontal stability fixed by dikes. Geomorphic problems remain.
Flood Control	If only Core Area is acquired, construct 22,100 ft of 2 ft to 3 ft high setback dikes to control flooding. If Expanded Restoration Area is acquired, construct 17,400 ft of 2 ft to 3 ft high setback dikes to control flooding.	Construction of 17,800 ft of 2 ft to 3 ft setback dikes to control flooding.	No flood control changes.

Table 1-2
Key Characteristics of the Proposed Action and PRRP Alternatives*

Characteristic	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Revegetation	Revegetation methods would be applied to new channel/floodplain corridor to assure stability. All disturbed areas would be revegetated, reseeded or enhanced by natural recruitment.	Revegetation methods would be applied to new channel/floodplain corridor to assure stability. All disturbed areas would be revegetated, reseeded or enhanced by natural recruitment.	No revegetation activities would occur as part of project.
Irrigation Diversions	Remove all diversion dams (10) to fit stable channel slope. Reconstruct all diversions and relocate four diversion points to match new channel grades.	Remove all diversion dams (10) to fit stable channel slope. Reconstruct all diversions to match new channel grades. Relocate Probst and Baum Diversion points.	No modifications to irrigation diversions.
Property Acquisition	Acquire all non-public parcels in Core Area along new river corridor (489.7 acres). Acquire non-public parcels in Expanded Restoration Area on a willing seller basis (198.2 acres).	Acquire 7.6 acres of land along river corridxcor. Acquire construction easement where needed. Minor increase in flood easement width (2 locations).	None

Table 1-2
Key Characteristics of the Proposed Action and PRRP Alternatives*

Characteristic	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Transportation	Protect 7 existing bridges; rebuild 2 private bridges. No relocation/reconstruction of existing paved roads.	Protect 9 existing bridges (4 private). No relocation/reconstruction of existing paved roads.	Protect 9 existing bridges (4 private). No relocation/reconstruction of existing paved roads.
Utilities	Cross 7 utility facilities. Relocate 2 utility facilities.	Cross 7 utility facilities. No utility relocations.	Cross 7 utility facilities. No utility relocations.

Notes:
*The No Action Alternative would not change any characteristics of the Provo River. Baseline conditions would continue including seven recreation access points, contiguous access to the river corridor for recreational angling, and a minimum instream flow of 125 cfs.

Table 1-3
Land Acquisition Under the Proposed Action and Alternatives

Reach	Core Area Acquisition (acre)	Expanded Restoration Area Acquisition (acre)	Construction Easement Acquisition (acre)
Proposed Action (Riverine Habitat Restoration)			
Reach 2	102.9	35.2	0
Reach 3	38.5	0	0
Reach 4	177.2	82.8	0
Reach 5	56.9	45.6	0
Reach 6	87.1	28.5	0
Reach 7	16.7	0	0
Reach 8	0	0	0
Reach 9	10.4	6.1	0
Total	**489.7**	**198.2**	**0**
Existing Channel Modification Alternative			
Reach 2	5.7	0	1.8
Reach 3	1.9	0	0
Reach 4	0	0	10.1
Reach 5	0	0	0.7
Reach 6	0	0	1.5
Reach 7	0	0	0
Reach 8	0	0	0
Reach 9	0	0	0
Total	**7.6**	**0**	**14.1**
Instream Structures Alternative	0	0	0

Notes:
1. Core Area and Expanded Restoration Area would be acquired in fee title.
2. All non-federal land to be acquired is currently in private ownership.
3. Project Area would be fenced.
4. All acreages are in addition to those required to meet baseline commitments.

1.4 Description of the Implementation and Management of Baseline Conditions

1.4.1 Implementation of Baseline Conditions for the Provo River Corridor

As described in Section 1.3 of this EIS, changes to the existing environment of the Provo River corridor would be implemented by the federal government as a result of prior decisions and commitments made in the Final Supplement to the Final Environmental Statement for the Municipal and Industrial System (USBR 1987). These commitments would be implemented regardless of a decision to implement the PRRP Proposed Action or any of the alternatives. The following sections describe these commitments.

1.4.1.1 Recreation Access Points

Seven new recreation access points (including parking and sanitary facilities) would be provided to the Provo River between Jordanelle Dam and Deer Creek Reservoir. The parking and access areas would be located as shown in Map 1-1. Safe and adequate access by the public to the established public access corridor would be assured. Access would be provided to both upstream and downstream sides of the river corridor at major road crossings. Total capacity of the seven parking areas would be limited to approximately 100 vehicles at one time. Final locations and configurations of the access areas and restroom facilities would be designed and integrated with the PRRP action selected for implementation.

1.4.1.2 Pedestrian Access

Pedestrian access would be provided for fishing and related or compatible uses through fee title land acquisition along the entire Provo River corridor between Jordanelle Dam and the inlet to Deer Creek Reservoir.

1.4.1.3 Corridor Fencing

Fencing of the public access corridor would be provided to control trespass problems and land uses. Standard fence would be 42-inch high wire field fences along the corridor. Metal line posts would be set about 16 feet apart, and interspersed with wood posts or steel braces every fifth post or as needed for additional strength at corners and turning points. Variations of fence type would be considered upon request of adjacent landowners. If fence construction desired by landowners is higher cost, cost-sharing may be required. Fences should prevent anglers and other users from straying onto private property and keep livestock out of the acquired corridor. Signs and brochures would be developed to alert the public to the need to respect private property. These measures are recognized as vital contributions to minimize conflicts between private land owners and public users. If access to watering is required by adjacent livestock operators, access would be accommodated or alternative replacement water sources provided.

1.4.1.4 Corridor Management and Size

The acquired corridor and constructed access facilities would be managed through a management agreement with a state or local entity (see Section 1.4.2). The width of the public access corridor under baseline conditions would basically be the area between the outside edge of the existing dikes, or an area extending about 50 feet beyond the typical bankfull active channel banks in undiked sections of the river. This would essentially establish federal fee title ownership to most property encumbered by flood and construction easements along diked sections of the river. Reach 4 is a unique section because there are no existing dikes. In Reach 4, the baseline acquisition requirements encompass all active channels at 1,200 cfs (the baseline bankfull flow).

1.4.1.5 Instream Flows

Maintaining a minimum instream flow of 125 cfs in the Provo River below Jordanelle Dam is a commitment that was achieved as of July 9, 1996 when Jordanelle Dam filled and became operational. Modifications to some existing diversions would be required to ensure flows remain in the river throughout this reach. To the extent funding allows, diversions also would be modified to improve fish passage.

1.4.1.6 Integration of Baseline with the Alternatives

Although these baseline conditions have been only partly achieved as of the date of this EIS, the impact analysis described in this EIS assumes all baseline conditions exist. Because baseline conditions do not completely exist, following a Record of Decision on the PRRP, implementation of the Proposed Action or alternatives would be integrated with and carried out concurrently with establishing baseline conditions. The Proposed Action and Existing Channel Modification Alternative would require Project Areas larger than required by baseline commitments for public access. The Instream Structures Alternative would not require additional acquisition beyond baseline. Because of the geographic overlap of baseline conditions and the PRRP, the Mitigation Commission would cooperate with landowners to the extent possible so that land acquisition negotiations would be conducted to avoid multiple and separate acquisitions from the same landowner if possible. For this reason, implementation of the baseline requirements for public access have been slowly and cautiously approached.

1.4.2 Management of the Provo River Corridor Under Baseline Conditions

The public areas along the Provo River between the two reservoirs would be managed under baseline conditions as a natural resource area, with primary recreational uses consisting of angling and other low-impact pursuits. Activities allowed include: angling, pedestrian use, and wildlife observation. Prohibited uses would include bicycles, roller-blades, equestrian users, and hunting. Most existing commercial uses within the corridor, e.g. livestock grazing and crossings of the river channel with livestock and farm machinery would not be allowed under baseline. Dike roads would be closed to motorized vehicles and bicycles to protect pedestrian users. Local participation in the management of facilities and users of the river corridor is vital. The Mitigation Commission proposes to develop an operating agreement(s) with Wasatch County, the Utah Division of Wildlife Resources and possibly other appropriate entities for management of the corridor. The Operating Agreement would identify and specify facility, infrastructure, and recreational user objectives, as well as biological resource objectives. The Operating Agreement would identify primary areas of responsibility and authority, specify costs of management, and commit funding sources to support ongoing development, operation and maintenance, and management of the project. Funding sources and assistance with management and operation and maintenance may include one or more of the following: user fees; volunteer efforts (such as a "Riverkeeper" program); Mitigation Commission funds; state or local funds; private donations.

Management needs, entities responsible for management, and funding sources are preliminarily identified below. Once finalized, these elements would serve as the foundation of an Operating Agreement.

- Regular Trash Collection at Parking Areas

  Responsibility: Wasatch County
  Funding Source: User Fees/Mitigation Commission/Volunteers/Donations

- Litter Control Along the River Corridor

  Responsibility: Recreation Users, Riverkeeper through Volunteers
  Funding Source: User Fees/Mitigation Commission/Volunteers/Donations

- Routine Maintenance of Fences, Trails, Signs, Rest Rooms and Parking Lots

  Responsibility: Wasatch County
  Funding Source: User Fees/Mitigation Commission/Volunteers/Donations

- Enforcement of Parking Limits

  Responsibility: Wasatch County Sheriff
  Funding Source: User Fees/Mitigation Commission/Donations

- Fish and Wildlife Law Enforcement

  Responsibility: Utah Division of Wildlife Resources
  Funding Source: User Fees/UDWR License Fees/Mitigation Commission /Donations

- Traffic Laws

  Responsibility: Wasatch County Sheriff
  Funding Source: User Fees/Mitigation Commission/Donations

- Peace Keeping

  Responsibility: Wasatch County Sheriff, UDWR (as encountered)
  Funding Source: User Fees/Mitigation Commission/Donations/UDWR

- Trespass on Private Lands

  Responsibility: Riverkeeper, Recreation Users, Wasatch County Sheriff
  Funding Source: User Fees/Mitigation Commission/Donations

- Search and Rescue

  Responsibility: Wasatch County Sheriff
  Funding Source: UDWR Habitat Authorization/User Fees/Mitigation Commission/ Donations

- Fee Collection and Administration

  Responsibility: Wasatch County
  Funding Source: User Fees

- Information and Education

  Responsibility: Riverkeeper, UDWR, Wasatch County, Mitigation Commission
  Funding Source: User Fees/License Fees/Mitigation Commission/Volunteers/Donations/ Other

- Volunteer Management

  Responsibility: Riverkeeper
  Funding Source: User Fees/Mitigation Commission/Volunteers/Donations

- Biological/Resource Management

  Responsibility: UDWR, Mitigation Commission
  Funding Source: User Fees/License Fees/Mitigation Commission /Volunteers/Donations

Management objectives for the Proposed Action or its alternatives would vary slightly from that described for baseline conditions, according to specific objectives of each alternative. Additional management considerations, if any, are described under each alternative (sections 1.5 through 1.8 of this EIS). Table 1-14 in Section 1.9 of this EIS depicts preliminary labor and cost estimates associated with operation, maintenance and management of the public corridor to be acquired and developed under baseline conditions.

1.5 Detailed Description of the Proposed Action (Riverine Habitat Restoration) — Physical Features and Other Characteristics

The Proposed Action (Riverine Habitat Restoration) would use a variety of measures to develop a more naturally functioning river system connected with its floodplain. These measures include river channel reconstruction, realignment, channel modifications, development of off-channel streams, wetlands and ponds, revegetation and other hydrologic approaches. All levees would be removed except where needed to protect bridges, railroad crossings and other public facilities, as long as adequate 100-year flood protection is provided by the expanded floodplain or a setback levee. A meandering riffle-pool channel interacting with a functioning floodplain would be developed wherever possible. In some areas, this could be accomplished by incorporating the present channel. In others, the present channel would be abandoned and a new channel alignment developed. Where possible, the

new river channel would be allowed to adjust its alignment within the designed meander width in response to changing hydrologic or geomorphic factors.

Table 1-4 lists the improvements that would be made in each reach of the Provo River under the Proposed Action. Map A-1 in the map pocket at the back of the EIS shows the location of the river channel alignment under the Proposed Action.

1.5.1 Channel Features

1.5.1.1 Features Common to All Reaches

The proposed channel would be a meandering riffle-pool channel characteristic of natural channels in low to moderately sloped valleys such as the Heber Valley. Riffles would be constructed to create narrower, shallower and faster water portions of the channel during low flow periods. Pools would be constructed to create wider, deeper and slower water portions of the channel during low flow periods. Typical bankfull channel top–widths would vary between 80 to 100 feet in the pools and 70 to 80 feet in the riffles. The floodplain width would be 500 feet or greater in all areas where practical. Table 1-5 summarizes channel and floodplain characteristics under the Proposed Action on a reach-by-reach basis and Figure 1-3 is a schematic of a typical channel section.

Existing river dikes would be breached or removed except where they provide protection to existing structures or other man-made features (e.g., roads, bridges) to develop the necessary floodplain width. Figure 1-4 shows typical removal of a river dike. Small portions of existing dike that support significant communities of valuable riparian vegetation may be retained, as long as adjacent breached or removed sections would be large enough to allow channel overflows to spread out onto the floodplain.

Additional property is needed for the Proposed Action beyond that acquired for baseline. Two different acquisition areas have been identified. The Core Area consists of lands required to implement and manage the Proposed Action (to meet the Project Need). The Expanded Restoration Area consists of lands that provide additional opportunities for fish and wildlife habitat development and protection. The PRRP Core Area encompasses 490 acres in addition to lands that would be acquired under baseline (see Table 1-7 in Section 1.5.3 for a detailed breakdown of land acquisition needs). Acquisition would be fee title, and would include all potential modes of acquisition. For acquiring the PRRP Core Area, eminent domain would be exercised if necessary, but only if all other feasible solutions have been unsuccessful. The PRRP Expanded Restoration Area would add to the PRRP Core Area along some sections of the river. The Expanded Restoration Area would be acquired on a willing-seller basis only. The Expanded Restoration Area would provide the land necessary to construct many of the potential side channels, wetlands and ponds within the Provo River floodplain, thereby further meeting the project need and fulfilling several additional project purposes (see Section 1.2.2). By separating the Expanded Restoration Area from the Core Area, the total acreage required to meet the Project need is reduced. It was also designed to allow the Core Area to be expanded to address the concern raised by some landowners that acquisition along the river corridor (Core Area) may create uneconomical remainder properties which landowners would not be interested in retaining. The Proposed Action includes potential acquisitions within the PRRP Expanded Restoration Area that could result in acquisition of up to 198 additional acres. The Expanded Restoration Area also would be acquired in fee title, but only on a willing-seller basis.

The average flow velocities for the Proposed Action are presented in Table 1-5. With the diversity of instream features, velocities at specific locations would vary greatly from these values dependent on the exact horizontal and vertical location in the cross-section and the position relative to features such as boulders, stream bank vegetation and organic debris. There also would be areas of much lower localized velocities within the stream than represented by the average velocities shown in Table 1-5.

Riffles would be constructed to maintain fish habitat throughout a range of river flows including low flows. Riffles are a natural channel-bed feature that mostly form between meanders. These semi-regularly recurring features, which come in a variety of shapes and forms, develop in areas within the river channel where sediment has been deposited. Restoration plans for the Provo River channel include constructing a variety of appropriately sited riffle features to provide a diversity of aquatic

Table 1-4
Summary of Proposed Action (Riverine Habitat Restoration) Improvements
Page 1 of 4

PRRP Study Reach	Improvements
Reach 1 Deer Creek Reservoir to End of Levees	• No improvements
Reach 2 End of Levees to Casperville	• Fill 3,250 feet of abandoned channel • Construct 6,500 feet of new channel • Remove or breach 5,410 ft of existing dike • Construct 3,820 feet of 2-ft high setback dikes to protect existing structures (2,250 ft if Expanded Restoration Area is acquired) • Raise or lower floodplain elevation over an area of 3 acres to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 29.0 acres of disturbed area • Extend Lower Charleston Canal 750 feet in upstream direction • Reconstruct Lower Charleston Diversion 750 feet upstream • Protect Winterton Bridge, gas line, and railroad crossing • Relocate Casper Bridge as directed by landowner • Construct one pond (1.6 acres) • Create 8,970 feet of side channels (4,930 ft in Core Area, 4,040 ft in Expanded Restoration Area)
Reach 3 Casperville to Island Ditch Diversion	• Fill 2,780 feet of abandoned channel • Construct 8,530 feet of new channel • Install 500 feet of special bank stabilization • Remove or breach 3,510 ft of existing dike • Construct 4,910 feet of 2-ft high setback dikes to protect existing structures (3,560 ft if Expanded Restoration Area is acquired) • Raise or lower floodplain elevation over an area of 1 acre to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 23.7 acres of disturbed area • Relocate Everett Slough Diversion 250 feet to the southwest • Extend Everett Slough 800 feet to meet new headgate • Extend Spring Creek 160 feet west to meet new channel alignment • Protect Midway Road bridge and gas pipeline crossing • Reconstruct Island Ditch Diversion at existing location

Table 1-4
Summary of Proposed Action (Riverine Habitat Restoration) Improvements
Page 2 of 4

PRRP Study Reach	Improvements
Reach 3 (continued)	• Create 6,030 feet of side channels (all in Expanded Restoration Area)
Reach 4 Island Ditch Diversion to End of Levees	• Fill 600 feet of abandoned channel • Construct 1,700 feet of new channel • Raise or lower floodplain elevation over an area of 2.5 acres to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 6.9 acres of disturbed area • Construct one pond (1.3 acres) • Create 5,070 feet of side channels (2,170 ft in Core Area, 2,900 ft in Expanded Restoration Area)
Reach 5 End of Levees to Probst Diversion	• Fill 3,320 feet of abandoned channel • Construct 5,770 feet of new channel • Install 200 feet of special bank stabilization • Remove or breach 6,280 ft of existing dike • Construct 3,330 feet of 2-ft high setback dikes to protect existing structures (2,530 ft if Expanded Restoration Area is acquired) • Raise or lower floodplain elevation over an area of 7.3 acres to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 41.0 acres of disturbed area • Reconstruct Probst Diversion 100 feet to southwest • Relocate 1,250 feet of Probst Irrigation Ditch • Construct one pond (1.3 acres) • Create 5,460 feet of side channels (all in Expanded Restoration Area)
Reach 6 Probst Diversion to River Road	• Fill 6,050 feet of abandoned channel • Construct 10,770 feet of new channel • Install 1,500 feet of special bank stabilization • Remove or breach 11,600 ft of existing dike • Construct 5,800 feet of 2-ft high setback dikes to protect existing structures (4,830 ft if Expanded Restoration Area is acquired) • Construct 3,570 feet of 3-ft high setback dikes to protect existing structures

Table 1-4
Summary of Proposed Action (Riverine Habitat Restoration) Improvements
Page 3 of 4

PRRP Study Reach	Improvements
Reach 6 (continued)	• Raise or lower floodplain elevation over an area of 4.1 acres to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 67.9 acres of disturbed area • Extend Gertsch Ditch 1,500 feet upstream • Relocate Gertsch Diversion 1,500 feet upstream • Extend Wilson Ditch 350 feet upstream • Relocate Wilson Diversion 350 feet to northeast • Protect River Road bridge crossing • Construct three ponds (4.8 acres) • Create 15,000 feet of side channels (4,500 ft in Core Area, 10,500 ft in Expanded Restoration Area)
Reach 7 River Road to Baum Diversion	• Fill 2,850 feet of abandoned channel • Construct 4,900 feet of new channel • Remove or breach 2,890 ft of existing dike • Construct 4,200 feet of 2-ft high setback dikes to protect existing structures • Raise or lower floodplain elevation over an area of 4.0 acres to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 24.6 acres of disturbed area • Create 2,800 feet of side channels (all in Core Area) • Relocate Baum Diversion • Construct four ponds (0.6 acres) for spotted frog habitat
Reach 8 Baum Diversion to Valeo Diversion	• Fill 2,500 feet of abandoned channel • Construct 4,600 feet of new channel • Remove or breach 770 ft of existing dike • Remove 1,700 feet of existing Jordanelle wetland dikes • Construct 1,800 feet of new Jordanelle wetland dikes • Raise or lower floodplain elevation over an area of 13.8 acres to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 28.2 acres of disturbed area • Create 3,480 feet of side channels (all in Core Area) • Construct one pond (2.6 acres) • Reconstruct Wasatch Diversion 50 feet downstream of present location in Wasatch Canal • Relocate (place beneath proposed channel thalweg) 500 feet of Jordanelle wetland water supply line

Table 1-4
Summary of Proposed Action (Riverine Habitat Restoration) Improvements
Page 4 of 4

PRRP Study Reach	Improvements
Reach 9 Valeo Diversion to Old U.S. 40	• Fill 4,870 feet of abandoned channel • Construct 10,430 feet of new channel • Remove or breach 5,480 ft of existing dikes • Remove 2,300 feet of existing Jordanelle wetland dikes • Construct 1,320 feet of new Jordanelle wetland dikes • Raise or lower floodplain elevation over an area of 8.5 acres to provide for improved interaction between channel and floodplain or to prevent channel avulsion • Revegetate 40.7 acres of disturbed area • Create 3,260 feet of side channels (250 ft in Core Area, 1,200 ft in Expanded Restoration Area) • Relocate (place beneath proposed channel thalweg) 200 feet of Jordanelle wetland water supply lines • Construct 2 buried grade control structures (350 feet) • Reconstruct Condie Diversion 200 feet to northeast • Protect quarry bridge, gas pipeline, and Old U.S. 40 bridge crossings • Relocate private bridge crossing • Reconstruct small diversion to deliver year-round water supply to USBR wetlands • Create 0.4 acres ponds to replace spotted frog habitat

Notes:

1. Special bank stabilization would be large rock buried in the channel bank at bends or other locations with high erosion potential.
2. Diversion structure reconstruction would be due to channel elevation and geometry changes; diversions must pass 125 cfs in the main channel.
3. Bridges and other crossings would be protected by placing large rock around abutments to prevent scour.

Table 1-5
Proposed Action (Riverine Habitat Restoration) Channel and Floodplain Reach Characteristics

									Mean Channel Velocity (ft/sec)					
Reach	Channel Length (ft)	Bankfull width (ft)		Floodplain width (ft)	Channel Slope (ft/ft)		Bankfull Depth[a] (ft)		Base Flow		Bankfull Discharge		100-Year Discharge	
		Riffle	Pool		Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool
2	6,500	80	100	960	0.008	0.004	4.3	5.8	2.7	1.6	5.0	3.9	6.5	4.8
3	8,390	80	100	560	0.008	0.004	4.3	5.8	2.7	1.6	5.0	3.9	6.5	4.8
4[b]	6,850	70	80	980	0.010	0.005	4.1	5.7	2.5	1.9	6.1	4.4	7.1	5.7
5	5,770	70	80	490	0.012	0.006	3.9	5.6	2.9	2.1	6.3	4.8	7.3	5.9
6	10,770	70	80	490	0.012	0.006	3.9	5.6	2.9	2.1	6.3	4.8	7.3	5.9
7	6,100	70	80	750	0.012	0.006	3.9	5.6	2.9	2.1	6.3	4.8	7.3	5.9
8	5,500	70	80	420	0.012	0.006	3.9	5.6	2.9	2.1	6.3	4.8	7.3	5.9
9	10,430	70	85	420	0.012	0.005	3.9	5.6	2.9	2.0	6.3	4.6	7.3	5.7

Notes:

Baseflow = 125 cfs
Bankfull Discharges = 1,200 cfs
100-year Discharge = 2,860 cfs
a Values are typical. Final design will incorporate variability on the order of +50%/-30%.
b Assumes channel will naturally develop these characteristics.

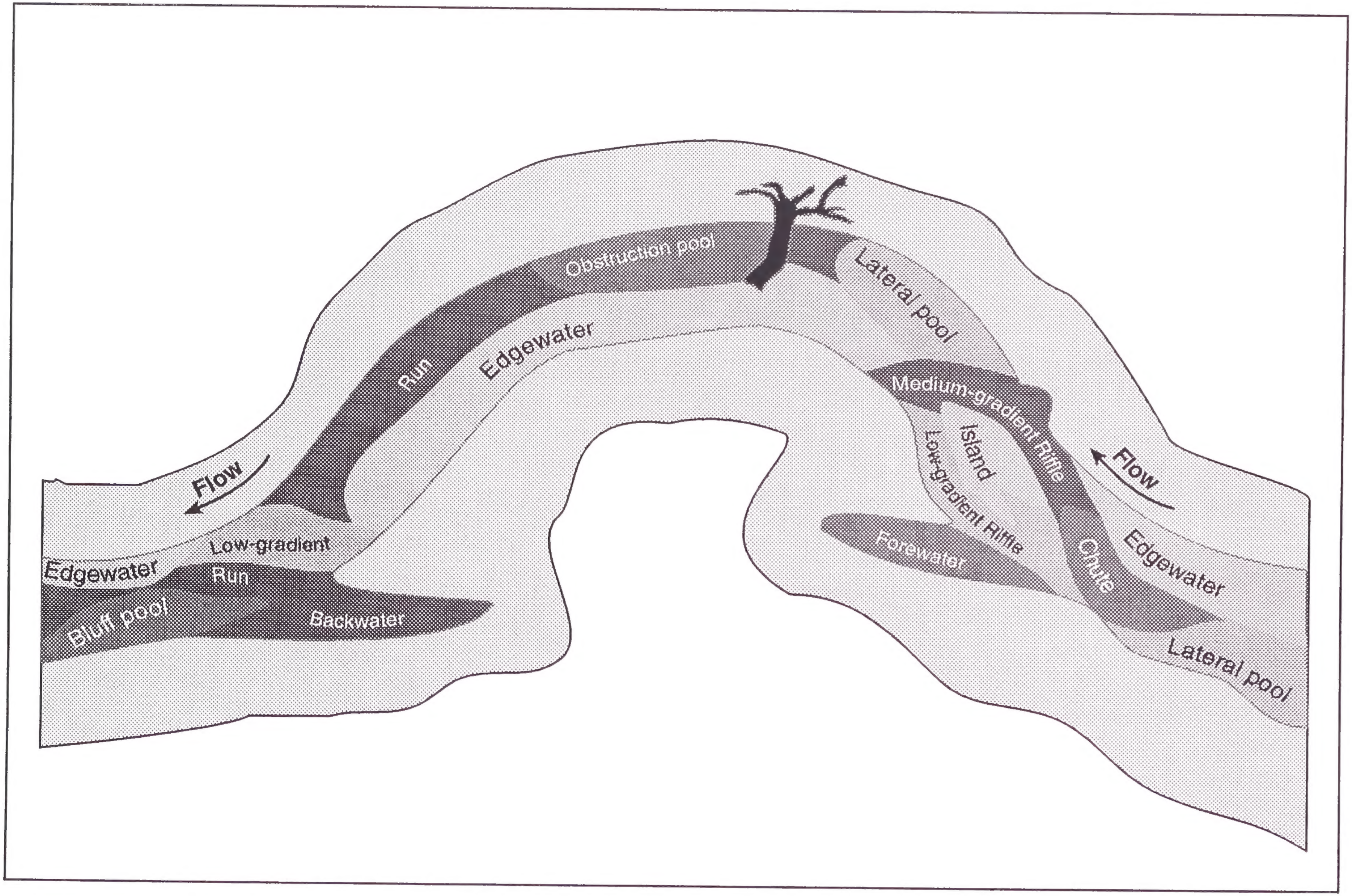


Figure 1-3
Schematic Drawing of Typical Segment of Provo River Channel Under the Proposed Action (modified from Rabeni et.al. 1993)[a]

[a] See Glossary for definition of terms

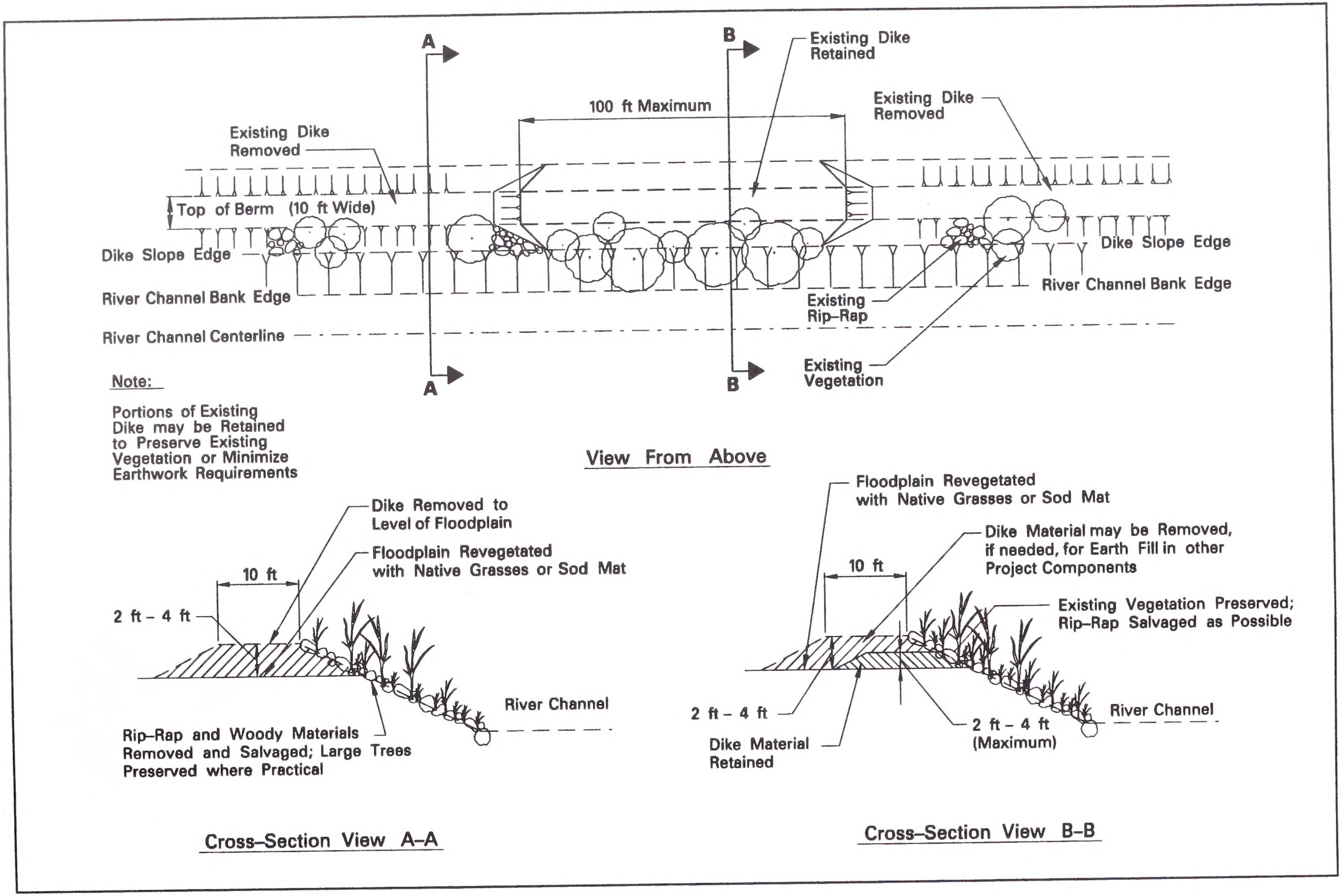


Figure 1–4
Typical Removal of Existing Dike

habitats, and to mimic the characteristics and function of natural channels. Designers would survey natural riffles to determine riffle design parameters (such as size, shape, slope, and materials) for the Proposed Action.

Two design features would be incorporated into the Proposed Action to ensure that the riffle profile remains stable. First, the material comprising the channel bed in the riffles would be larger than in the pools. The median size of riffle material would be calculated using shear-stress methods during the final design phase. Restoration construction would require selective handling and possibly mechanical sorting of source materials to achieve proper gradation. Second, minor grade control structures would be constructed, if necessary, at the upstream (head) and/or downstream (tail) ends of each riffle. These structures would consist of larger than average boulder and cobble material. The exact gradation of material would be determined during the final design phase (see the PRRP Technical Report (CUWCD 1994) Description of Proposed Alternatives for more detail on these structures). In some of the steeper riffles, a rapid or drop-pool sequence could be created by a combination of boulders constricting and redirecting the flow in the horizontal plane and partial pour-overs or ledges redirecting the flow in the vertical plane.

Channel cross-sections in pools would be designed with the deepest portion against the outside bend and a point bar on the inside of the bend. The deep portion of the pool at the outside of the bend is the natural condition. This feature would maintain contact between river flow and the vegetated bank during low flow conditions. Maximum depths in the pools at bankfull discharge would range from 5 to 6 feet.

In areas where river channel stability is essential the outside of the bends would be protected with large boulders, root wads and vegetation. In areas where critical structures are not located adjacent to the channel, bank protection would be constructed of biodegradable geotextile fabrics or similar materials that would allow the river banks to deform after the end of their design life. Large boulders and large woody material would be used to create habitat diversity and possibly protect high-stress areas along the banks. In areas that are deemed critical, erosion protection would be provided by a well-graded continuous rock feature. However, the continuous rock mass could be placed away from the channel, but within the river corridor. If placement of rock rip-rap along the channel is necessary, it would be hidden by placement of boulders, woody debris, gravel and cobble, soils and vegetation. These rock blankets would act as second lines of protection in the event significant bank erosion starts in the critical areas.

In addition to constructed bank protection, the existing bank protection (i.e., riprap) would be left in place at locations where it protects existing structures such as bridge abutments. Buried grade control structures would be incorporated at two locations where control of potential channel degradation is important. The following describes these locations:

- In the first meander series downstream of old US Highway 40, where the sediment-free reservoir discharges would have a strong tendency to erode the channel bed and banks;

- Downstream of the new US Highway 40 bridge, where the flow leaves a narrowly confined and high velocity section.

Buried grade control structures would be constructed from placed rock and would not protrude above the channel bed.

In sections of the river where channel alignment is not restricted by large diversions, bridges or other constraints, the channel would be allowed to adjust itself within the designed alignment over time in response to hydrologic and sediment transport conditions.

Existing irrigation diversions would be reconstructed and some would be relocated under the Proposed Action. This is necessary because of proposed changes in the river alignment and bottom elevation and to eliminate the existing hard diversion dam sills and large drop features. All diversions located on the Provo River, within the project area, would be designed to pass the mandated 125 cfs base flow. The following diversion facilities would be relocated and the existing irrigation ditches would be extended to a new point of diversion:

- Lower Charleston Diversion
- Everett Slough Diversion
- Gertsch Diversion
- Wilson Diversion
- Baum Diversion

Map A-1 in the pocket at the back of the EIS shows approximate locations of existing and new points of diversion.

The need for the Valeo Diversion would be eliminated by designing the river to deliver adequate flow to the Wasatch Canal diversion point. Reconstructed diversions would be located on the outside bend of a river meander to improve operations under low flow conditions. Diversion structures would consist of headwalls and manually operated gates (similar to the existing structures) but there would be no hard sills spanning the entire river bottom. Boulder placements, as well as the natural channel structure on the outside of a meander, would direct flows to the diversion structure even during low water periods.

Most of the existing road and pipeline crossings could be preserved under the Proposed Action. Exceptions are the Casper Bridge and the private bridge in the upper portion of Reach 9, which would be relocated to accommodate the new channel alignment. All other crossings by major roads, railroads, and utility pipelines would remain intact. Abutments and piers would be protected with placement of large rock salvaged from the existing levee riprap.

1.5.1.2 Specific Reach Features

Improvements are not proposed for Reach 1 because it falls within the Deer Creek Reservoir flood easement and is subject to inundation during periods of maximum reservoir storage. This creates a situation in which improvements would be short-lived because of sediment deposition and highly variable hydraulic conditions.

Short sections of Reaches 3, 7 and 8 would have step-pool channel geomorphology. This channel type is defined as moderately entrenched, with a moderate gradient and relatively straight platform, and dominated by riffles, small drops and pools. Channel segments designed with these characteristics are required because of a combination of manmade and natural constraints that force the channel into a straight alignment for distances of about 1,000 feet.

Only minimal intervention is proposed for Reach 4 to ensure compatibility with upstream and downstream reaches. This represents a change from the Draft EIS. The existing Reach 4 system has a broad floodplain unrestrained by dikes in which multiple, shifting channels of the past appear to be transforming into a single-thread meandering channel that meets the goals of the PRRP's Proposed Action. Past channel instability in this section has been created by deposition of sediment carried through upstream diked reaches. Proposed upstream river modifications as well as the regulated Jordanelle Reservoir releases appear to have reduced sediment deposition problems in this reach. Most of Reach 4 river alignment would be allowed to adjust itself in response to operational and management changes. The major focus of the Proposed Action in Reach 4 is acquisition of the 100-year flood zone in fee title. This area is already within the existing flood easements owned by the federal government since the 1950s. Although these easements would allow the federal government to complete the Proposed Action features within Reach 4 without additional acquisition, public access requirements and management objectives require acquisition of fee title. The Core Area is designed to contain the 100-year flood zone in Reach 4. The Expanded Restoration Area encompasses the remainder of the existing flood easements in Reach 4. Construction of new channel is proposed only in a few short segments where needed to connect partially formed meanders or to accommodate diversions or similar needs. This approach would ensure long-term geomorphic stability of the proposed (developing) channel. Channel design for selected features in this reach would utilize the existing active channel features as much as possible. The current channel within Reach 4 is expected to continue stabilizing into single meandering channel surrounded by riparian vegetation.

Four ponds would be created in Reach 7 (0.6 acre) on existing federal property to provide additional suitable habitat for overwintering of spotted frogs. Final locations and dimensions would be determined during final design with input from the Bonneville Basin Conservation and Recovery Team and its technical advisors. In Reach 9, four small (about 0.1 acre each) deep water wetland habitats would be constructed to replace similar habitats that would be removed during construction. An existing diversion from the river would be rebuilt to provide water directly to several USBR wetland mitigation areas, for delivery of year-round water supply.

1.5.2 Floodplain Features

A key component of the meandering riffle-pool channel design is sizing the cross-section so flows spill into the floodplain on about an every-other-year basis. This would benefit channel stability and the surrounding riparian corridor. The floodplain interaction would be accomplished by selecting channel dimensions to convey approximately 1,200 cfs (the peak flow that has a recurrence interval of 1.5 years). River flows would spill into the floodplain when this flow is exceeded. The surrounding area would be selectively contoured to create a floodplain where necessary. Every effort would be made during final design to minimize the amount of off-channel grading required to establish contact between the channel and the floodplain. Grading would disturb the vegetation and topsoil in the riparian corridor and would be avoided where practical. Graded areas would be restored to riparian vegetation types in the PRRP corridor. Vegetation consistent with natural wetland, riparian or upland areas would be established in areas that the federal government would acquire for the project.

The old channel would be incorporated as the floodplain for the restored channel in some areas. This would be accomplished by only partially backfilling the old channel where it lies on the inside of new channel bends. The restored channel would be aligned away from historical terraces and river bed slopes would be varied in the riffle and pool sequence to minimize the need for grading. The transition between the channel and the floodplain on the inside of the bends would be subtle. The point bars would be sloped up to the floodplain on a gentle slope that is consistent with those measured in similar natural channels. This would encourage initial channel overflows to occur on the inside of river bends and promote more extensive riparian vegetation development on the point bars and within the area of construction disturbance (i.e., meander belt).

The meandering channel with a re-connected floodplain in the Proposed Action offers opportunities for incorporation of several desirable floodplain features, including wetlands, ponds, side channels and setback dikes.

1.5.2.1 Wetlands and Ponds

Project plans call for creation of a variety of wetland types interspersed within the Core Area and Expanded Restoration Area. The Mitigation Commission identified eleven wetland sub-types that would provide habitat diversity needed to support a rich biological community. Table 1-1 lists the wetland subtypes. Figure 1-5 displays several of the wetland subtypes as they might be constructed under the Proposed Action. Designers would select suitable locations for these features, and would base their selections on topography, construction impacts, cost/benefit, wildlife needs, other landscape features, and desired riparian vegetation condition.

The Proposed Action includes between five and ten new ponds located within the Core Area and Expanded Restoration Areas. The ponds would provide a combination of emergent marsh and deep open water habitats that would add considerable habitat diversity to the project. Aside from the constructed Jordanelle Wetland cells, the only significant floodplain ponds in the river corridor are Condie, Berkenshaw, and Hogle. In addition, eight small ponds would be constructed (four in Reach 7 and four in Reach 9) to provide over wintering habitat for spotted frogs.

Ponds would be excavated to accommodate a water depth ranging from 10 to 15 feet. This depth would be required to minimize the growth of aquatic weeds and limit the freezing depth to maintain adequate year-round fish or amphibian habitat. The pond sizes and shapes would vary depending on available land and surrounding topography. These features would be blended to their surroundings and give them a natural appearance. In most cases water would be supplied to the ponds from the Provo River through open channels. A secured water right for these features would probably be required. An inlet and outlet would be constructed at each pond to provide flow-through of the water. In some cases water may be available from natural springs or groundwater. If necessary, ponds would be sealed by one or more methods to reduce water loss through infiltration. Lining alternatives include compaction of granular soils and application and tilling of bentonite. In the event some ponds are excavated to a depth that intercepts the groundwater table, no liner would be required. Spoil from pond construction would be disposed of in the same manner as spoil from

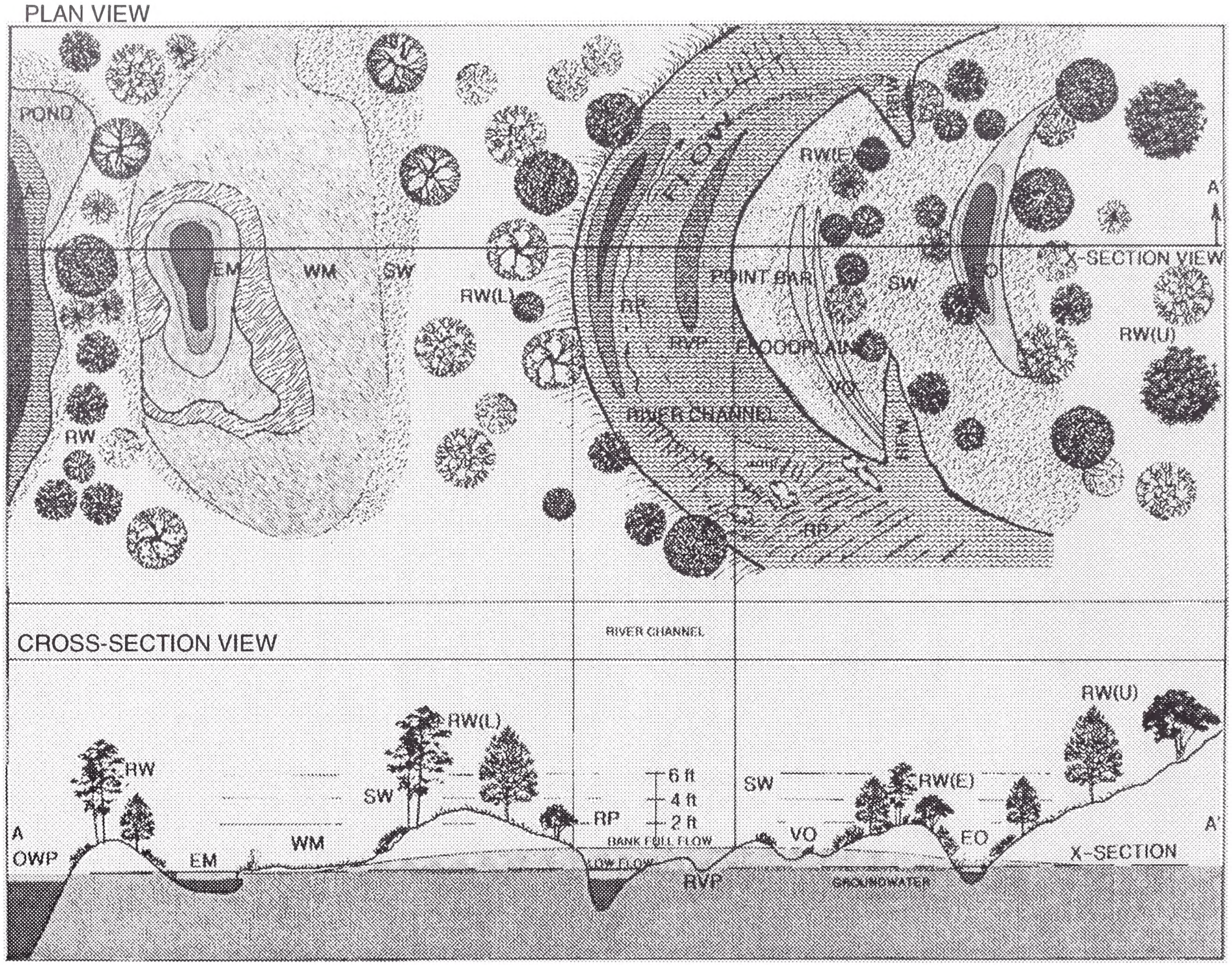


Figure 1-5
Schematic Drawing of Wetland Subtypes Under the Proposed Action

construction of the main channel (see Section 1.5.4.1).

Some ponds could accommodate one or more small islands to provide nesting and foraging habitat for waterfowl with protection from land predators. Islands would be planted with riparian vegetation such as cottonwood, willow and riparian grasses.

The perimeters of the ponds would be constructed with an irregular shape to increase edge habitat and to blend more naturally with adjacent upland and riparian vegetation. Ponds would provide habitat for aquatic and terrestrial wildlife. Adjacent areas surrounding the ponds and emergent marsh could be developed to support riparian vegetation such as cottonwood and willows to provide more ecological diversity along the river corridor.

Ponds would be constructed to provide a 6- to 20-foot-wide shelf area around part of the pond perimeter where the topography is graded to elevations ranging from four inches to two feet below the water surface. This shelf area would be planted with emergent plant species such as bulrush and pondweed. The emergent marsh habitat would provide food and cover for wildlife and waterfowl.

The location of pond sites is shown on Map A-1 in the map pocket at the back of the EIS. Exact numbers, locations and "footprints" would be adjusted during final design based on local topography, soil conditions, vegetation, landowner preferences and other factors. Table 1-6 summarizes the pond acreage to be constructed in each reach of the project. Approximately 12.6 acres of ponds would be constructed along the Provo River corridor if the entire Expanded Restoration Area were to be acquired, which would create 8.3 acres of open water habitat and 4.3 acres of emergent marsh habitat. About 9 acres of the ponds would occur within the Core Area. Final locations and dimensions would be determined at final design.

1.5.2.2 Side Channels

The Proposed Action would include approximately 14 side channels in Reaches 2 through 9 in the Core Area and Expanded Restoration Area. The main purpose of side channels would be to provide additional fish and amphibian habitat and aquatic diversity. In addition, they would enhance wetland areas off the main river channel. Some of these channels would carry fairly constant flows up to about 10 cfs, while others would fluctuate with seasonal changes in river flows. These flow levels would be adequate to simulate small spring-fed stream and secondary channel conditions without significantly reducing flows and associated habitat in the main channel.

Two types of side channels are proposed. The first type would involve construction of new small meadow-type channels in the floodplain. The typical constructed side channel cross-section would have a depth between 1 and 3 feet and a width between 2 and 10 feet. The alignment would be highly sinuous. Water velocities would range between 1 and 5 feet per second. The second type of side channel would use remnants of abandoned distributary channels or abandoned irrigation ditches in the floodplain. These remnants are typically mildly meandering sections, and some are currently incorporated into the existing irrigation conveyance system. Several of the existing remnant channels are surrounded by cottonwood galleries that would create riparian canopy cover conditions for the side channels. The effort required to develop these side channels would be relatively small, provided the remnant channels have the appropriate cross-section relative to the available flow. In some cases, minor modifications of the existing features would be made to balance conveyance capacity with the available flows.

Side channel flows would be diverted from the main river channel using passive diversion systems (i.e., no manually operated headgates). These could consist of small pipes through the channel bank to the side channel or buried infiltration trenches (french drains) composed of boulders and large cobble. Experimentation would be necessary to select designs that minimize long-term maintenance requirements. Side channels would discharge back to the main river channel, allowing fish migration from the main river into the side channels.

Net water losses in the side channels and ponds would occur from consumptive losses such as evapotranspiration and, in some instances, percolation to the shallow groundwater aquifer. Therefore, a designated water right would be required to support these features. It is estimated that a total water right of about 1 cfs would be required to compensate for consumptive uses of side channels and ponds under the Proposed Action.

Table 1-6
Ponds and Side Channels Developed
Under the Proposed Action (Riverine Habitat Restoration)

	Ponds			Side Channels	
Reach	Total Acres	Open Water (Acres)	Emergent Marsh (Acres)	Total Length (ft)	Total Area (acres)*
2	1.6	1.1	0.5	8,970	2.6
3	0	0	0	6,030	1.7
4	1.3	0.9	0.4	5,070	1.5
5	1.3	0.8	0.5	5,460	1.6
6	4.8	3.5	1.3	15,000	4.3
7	0.6	0.4	0.2	2,800	0.8
8	2.6	1.2	1.4	3,480	1.0
9	0.4	0.4	0	3,260	0.9
Total	12.6	8.3	4.3	50,070	14.4

Notes:
*Side channel area = the channel length x 12.5 feet width which includes a 2.5 foot wide channel.

This water allocation could be provided by the water rights associated with the lands to be acquired under the Proposed Action. Approximately 60 irrigated acres could be acquired under baseline conditions, and an additional 233 acres could be acquired under the Proposed Action. The Morse Decree (1921) allocated up to 1 cfs per 60 irrigated acres in Heber Valley outside of the North Fields area during the growing season. At this rate, a water right of up to about 3.9 cfs could be acquired by the federal government as part of the public access requirements. In normal hydrologic years this full water right can be supplied at the beginning of the season, but available water falls to about half the right by the end of the growing season. This would be sufficient to support the proposed off-channel features (side channels and ponds).

Map A-1 in the map pocket at the back of the EIS shows typical locations of side channels. These features would be refined during final design based on local topography, soils, vegetation, landowner preferences and other factors. Table 1-6 lists potential side channel lengths by stream reach. Approximately 50,070 feet of side channels would be constructed, including 19,340 feet (39 percent) within the Core Area.

1.5.2.3 Setback Dikes

Setback dikes would be required in some areas to limit the 100-year floodplain to non-hazardous areas after removal of the existing dikes. Setback dikes would have a typical height of 2 to 4 feet and a top width of 15 to 30 feet. Figure 1-6 shows a schematic of a typical setback dike. They would be designed to blend in with existing fields and pastures to minimize visual impacts. Setback dikes would be located far enough from the channel to maintain geomorphically suitable floodplain conditions.

Most setback dikes would be located at the edge of the Core Area. In some locations, setback dikes are proposed at the margin of the Expanded Restoration Area. In locations where the Expanded Restoration Area is not acquired, setback dikes would be constructed at the edge of the Core Area and the 100-year flood event would be contained by the setback dikes.

A revegetation and monitoring/maintenance plan would be developed for the setback dikes as part of final design. Setback dikes would be revegetated to blend in with the restored riparian zone. Revegetation methods are discussed further in Section 1.9.6.1. If property within the Expanded Restoration Area is acquired, some setback dikes would be located at the boundary of those areas.

Locations of proposed setback dikes are shown on Map A-1 in the map pocket at the back of the EIS. Table 1-4 lists setback dike lengths by stream reach.

1.5.2.4 Abandoned Channel

Abandoned reaches of the existing channel that are not in locations of proposed wetlands, ponds or side channels would be filled to the new floodplain level. Figure 1-7 shows how the abandoned channel cross-section would be filled. These filled areas would be revegetated and integrated into the adjacent land. The source of fill material would be from excavation of the new channel. Because the project would have excess excavated material compared to fill requirements, placing material in the abandoned channel reduces off-site disposal haul requirements. The abandoned channel areas that would be filled are within the baseline public access corridor, and would remain in public ownership under the Proposed Action. Therefore none of these areas would be available for agricultural uses. Map A-1 (see pocket at back of EIS) shows abandoned channel areas that would be filled; other sections of abandoned channel would be set aside for development of wetland, side channel and pond features. These features have been conceptually identified at this time, and the impacts reported represent a "worst-case" or maximum condition for analysis. However, specific decisions on treatment of particular sections of abandoned channel would be made during final design.

1.5.2.5 Jordanelle Wetlands

The Proposed Action would encroach into some of the U.S. Bureau of Reclamation (USBR) constructed Jordanelle Wetlands area to develop sufficient floodplain width in Reaches 8 and 9. This would require relocating some of the outside wetland dikes and removing imported wetland topsoil to lower the ground elevation to the new design floodplain level. A cross-section of the typical encroachment into the USBR wetlands is shown in Figure 1-8. Dikes would be reconstructed to confine the wetland ponds at the edge of the new floodplain; removed topsoil would be salvaged for use elsewhere in the project.

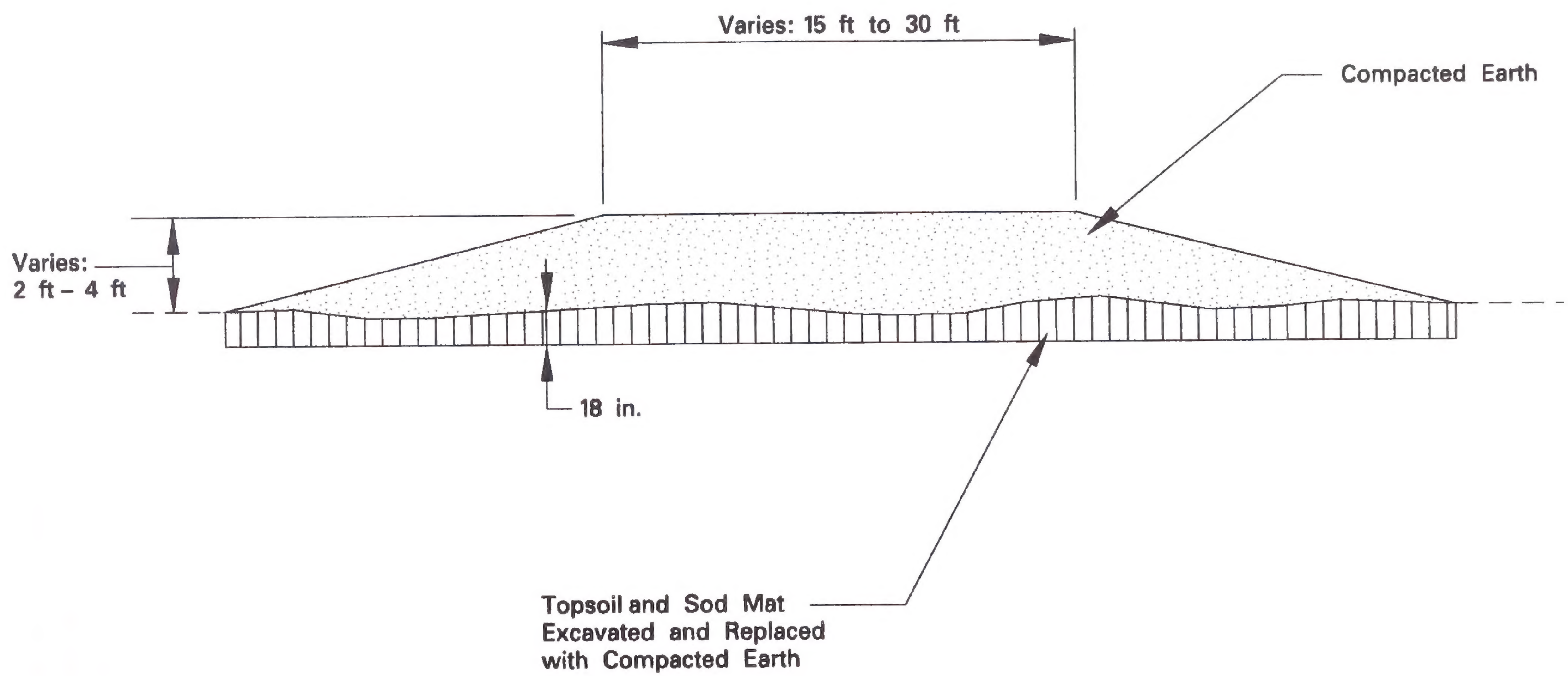


Figure 1–6
Schematic Cross–Section of
Typical Setback Dike

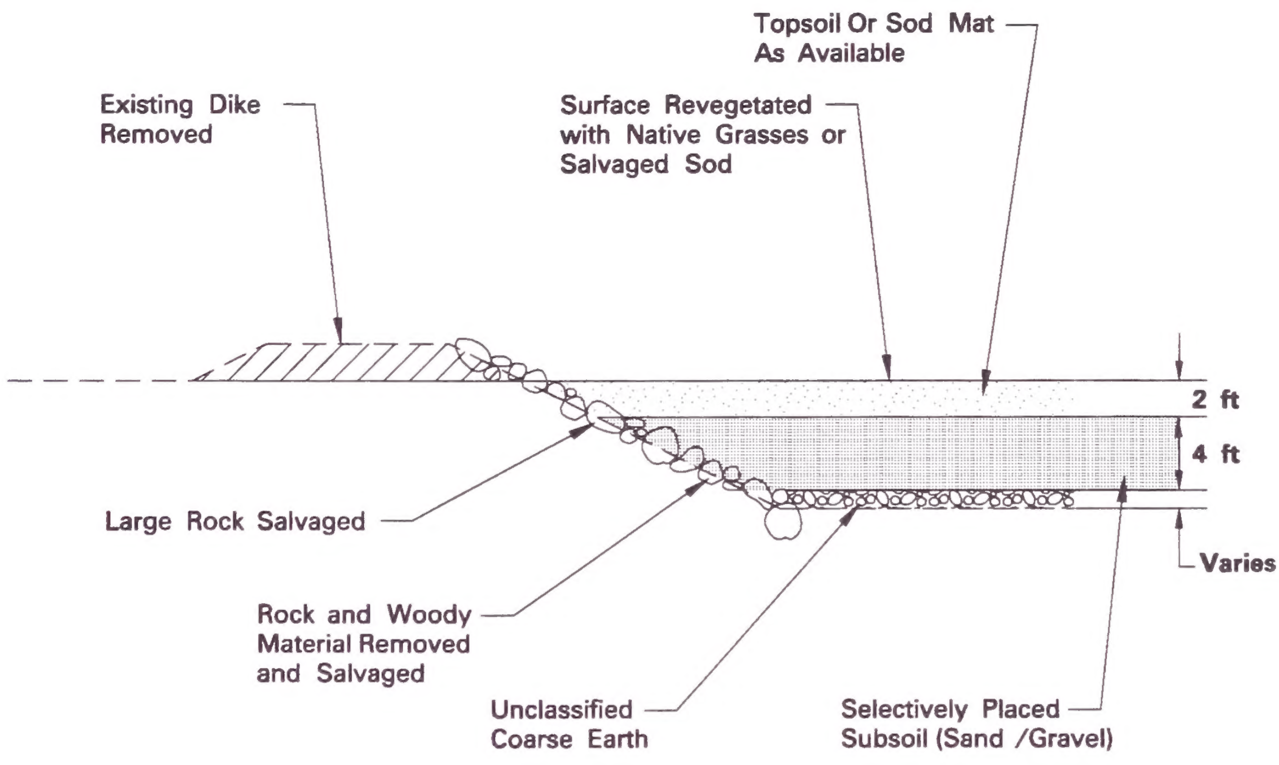


Figure 1–7
Schematic of Typical Fill of
Existing Channel to be Abandoned

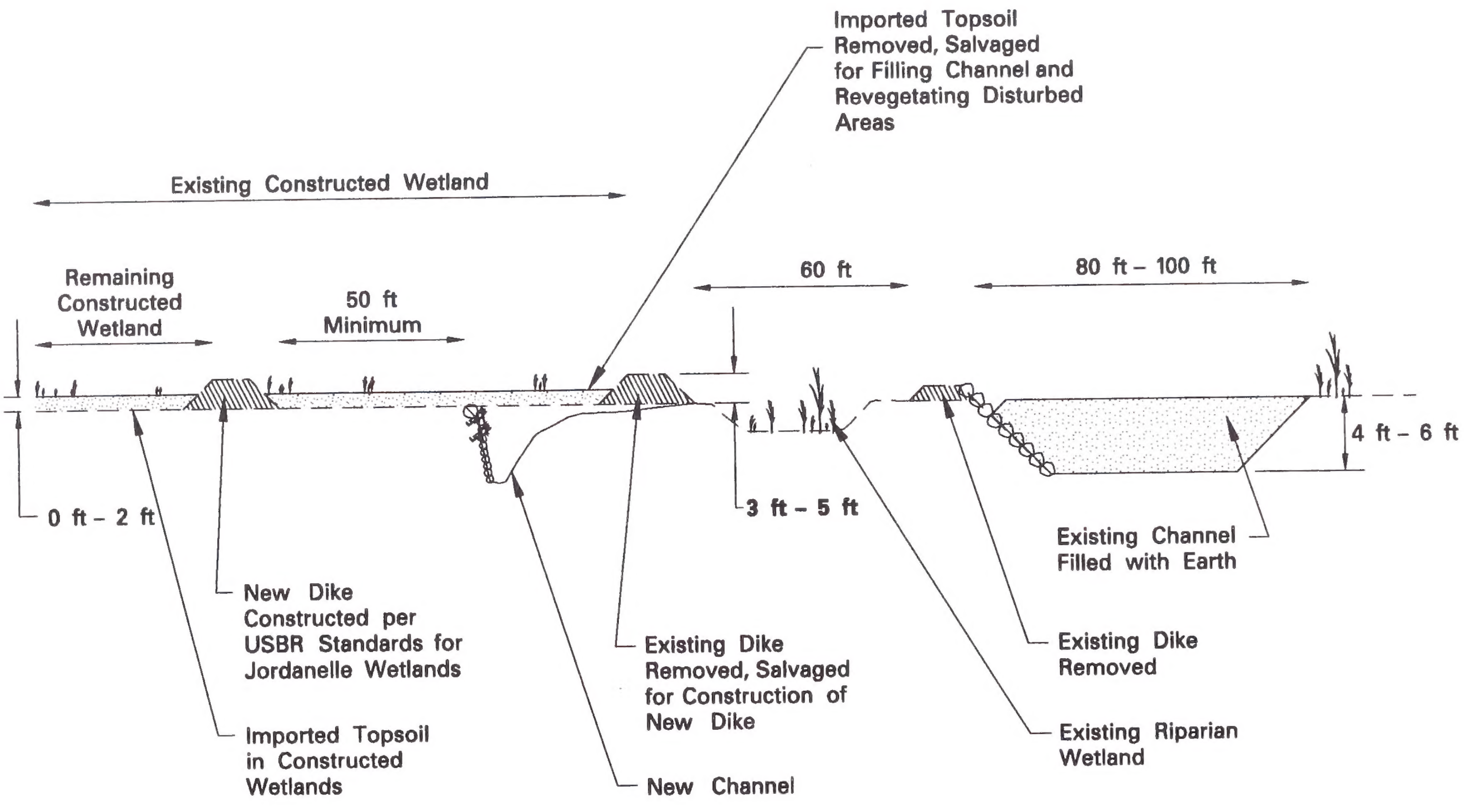


Figure 1–8
Cross–Section of Typical Encroachment into Bureau of Reclamation Constructed Wetlands

Map A-5 in the map pocket at the back of the EIS shows locations of modifications to the Jordanelle Wetlands ponds and dikes. Some USBR wetland cells in Reaches 8 and 9 would be modified under the Proposed Action to increase water depth and retention of year-round water sources to provide over-winter habitat for spotted frog and other amphibian species.

1.5.2.6 Public Access

The seven public access points shown on Map 1-1 in Section 1.3.1 and an access corridor along the existing river channel would be developed under baseline conditions. Under the Proposed Action, public access would be provided to the Core Area and, if acquired, to the Expanded Restoration Area. Map A-3 in the map pocket at the back of the EIS shows land acquisition and public access areas for this alternative. Construction access areas are estimated at less than one acre for the Proposed Action and could be changed in the future because of Proposed Action feature changes in the final design or resulting from negotiations with specific landowners. For these reasons, they are not shown on the map.

The boundary of the acquired property would be fenced. This would keep livestock out of the river channel and other created water features, and keep the public inside the corridor to minimize impacts on adjacent landowners. Most existing federally owned parcels are already fenced; it is assumed that those that are not would be fenced as part of baseline conditions, along with the remainder of the baseline public access corridor.

1.5.3 Changes in Ownership and Land Use

Implementation of the PRRP Proposed Action would result in changes in land ownership and land use. Construction activities would cause temporary changes lasting 1 to 3 years. Acquisition of additional land — beyond that acquired for baseline conditions — for placement of new features would cause permanent changes.

1.5.3.1 Land Ownership

Figure 1-9 is a schematic showing typical land acquisition requirements. In response to landowner concerns raised during review of the DEIS, the Proposed Action has been modified to make implementation of some of the side channel and pond features described as part of the Proposed Action in the DEIS an optional component of the project. The Expanded Restoration Area depicted on Figure 1-9 is an area that only would be acquired from landowners on a willing-seller basis. The features that could be incorporated within the Expanded Restoration Area may include additional wetlands, ponds, and side channels. These would be in addition to those floodplain features that would accompany the main channel alterations occurring within the Core Area.

Table 1-7 lists acres temporarily disturbed, permanently removed for construction of PRRP features, and permanently acquired for habitat restoration or protection under the Proposed Action and PRRP alternatives. The following defines each type of land use included in Table 1-7:

- Existing Irrigated Agriculture — Areas where sprinkler or flood irrigation is used to cultivate crops, according to the 1990 Utah Division of Water Resources "Water-Related Land Uses" map (Utah Division of Water Resources 1993)
- Existing Non-Irrigated Agriculture — Areas where livestock are raised without surface irrigation (based on the 1990 Utah Division of Water Resources "Water-Related Land Uses" map)
- Existing Undeveloped Upland — Areas with a predominant ground cover of upland grasses and shrubs that are not developed for human habitation (based on 1993 field verification and the 1990 Utah Division of Water Resources "Water-Related Land Uses" map)
- Existing Undeveloped Riparian — Areas with a predominant ground cover of riparian understory plants, shrubs and overstory trees that are not developed for human habitation (based on 1993 field verification and the 1990 Utah Division of Water Resources "Water-Related Land Uses" map)

For the most part, the baseline public access corridor would lie within the current federal construction and/or flood easement boundaries along the river. Although the United States currently has authority to construct any project features including the Proposed Action within the existing federal construction easements along the channel, fee title

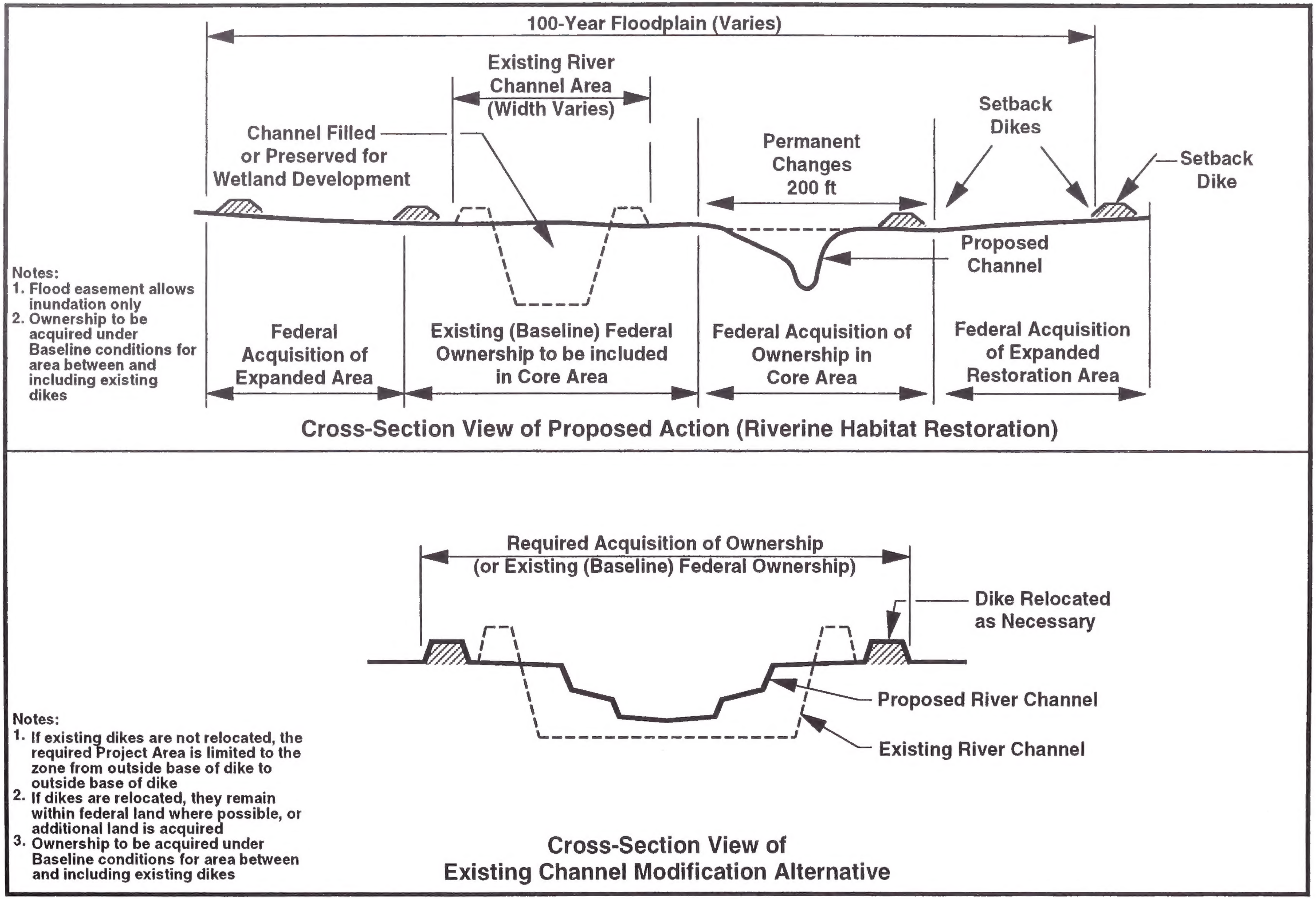


Figure 1-9
Schematic of Typical PRRP Property Requirements

Table 1-7
Areas to be Temporarily Disturbed, Permanently Removed or Protected for Wildlife Habitat Under the Proposed Action and PRRP Alternatives

	Acres Temporarily Disturbed and Reclaimed to Present Use in the Core Area/ Expanded Restoration Area			Acres Permanently Removed by Project Features in the Core Area/ Expanded Restoration Area			Acres Permanently Converted to or Protected for Wildlife Habitat in the Core Area/ Expanded Restoration Area		
Existing Land Uses	**Proposed Action**	**Exist Chnl Mod Alt**	**Instream Struc Alt**	**Proposed Action**	**Exist Chnl Mod Alt**	**Instream Struc Alt**	**Proposed Action**	**Exist Chnl Mod Alt**	**Instream Struc Alt**
Irrigated Agriculture	0.0/0.0	0.0	0.0	40.1/2.9	0.0	0.0	162.6/82.7	7.6	0.0
Non-Irrigated Agriculture	0.0/0.0	0.0	0.0	4.6/0.8	0.0	0.0	13.1/7.6	0.0	0.0
Undeveloped Upland	70.4/4.2	2.2	0.0	24.1/4.2	20.3	0.0	206.0/83.3	0.0	0.0
Undeveloped Riparian	120.8/04	130.5	0.0	30.3/0.2	3.9	0.0	8.9/16.5	0.0	0.0
Total	**191.2/4.6**	**132.7**	**0.0**	**99.1/8.1**	**24.2**	**0.0**	**390.6/190.1**	**7.6**	**0.0**

Notes:
1. Acres Temporarily Disturbed and Reclaimed to Present Use are agricultural lands outside the Core Area and Expanded Area on undeveloped lands anywhere in the project area.
2. Acres Temporarily Disturbed and Reclaimed are disturbed by construction roads, construction zone and stockpile areas, graded floodplains, setback dikes, and filled abandoned channel.
3. Acres Permanently Removed by Project Features are removed by main channel, side channel, pond and setback dike features anywhere in the project area.
4. Acres Permanently Converted to or Protected for Wildlife Habitat is land acquired in fee title for the Core Area and Expanded Restoration Area exclusive of acres permanently removed by project features.
5. Core Area contains the main channel and some side channel, pond and setback dike features. The Core Area is different for the Proposed Action and each alternative.
6. Expanded Restoration Area contains additional side channel, pond and setback dike features and is only applicable to the Proposed Action.
7. Exist Chnl Mod Alt - Existing Channel Modification Alternative.
8. Instream Struc Alt - Instream Structures Alternative.
9. All federally owned land along the river Core Area is categorized as Undeveloped Upland or Undeveloped Riparian.
10. Existing land uses are based on the 1991 Wasatch County map "Water-Related Land Uses".
11. All alternatives may require less than 1.0 acre of temporary disturbance to agricultural lands during construction. Such land would be reclaimed to agricultural use following construction.

to private areas in the river corridor would be acquired to protect the resources developed under the PRRP and make them available to the public under managed conditions.

The property required for project implementation and management would be permanently acquired or encumbered in one of several possible ways:

- Fee title purchase from willing sellers
- Fee title or easement purchase from willing sellers allowing for construction, habitat restoration and protection, flooding, and/or public access (PRRP Proposed Action - Expanded Restoration Area only)
- Land exchanges
- Eminent domain/condemnation (only as a last resort) of fee title (Core Area only)
- Donations

The Mitigation Commission would work in cooperation with U.S. Bureau of Reclamation and others to complete acquisitions. Specific options would be investigated on a parcel-by-parcel basis with each individual property owner. Table 1-3 lists PRRP property acquisition requirements under the Proposed Action and alternatives. Ownership changes would be associated with purchase of fee title by the United States government but not with purchase of construction easements. Private property owners would be compensated at the fair market value. No land owned by local cities, Wasatch County, or the State of Utah would be acquired for the Proposed Action because none is required. Most of Reaches 8 and 9 are in federal ownership, therefore up to only 16.5 acres of property acquisition would occur in the upper 2.5 miles of the PRRP Project Area.

1.5.3.2 Land Use

Construction vehicles and equipment would use temporary access roads to move from existing public roads to construction areas throughout the project area. The majority of these roads would be situated along the existing and proposed channel alignments or along the existing dikes, and would become part of the area acquired for the Core Area. Land uses of all types would be temporarily restricted on access roads during construction. Less than one acre of existing lands outside the Core Area would be needed for construction access roads. Existing and planned land uses could resume after construction on access roads not in the acquired Core Area.

The Project Area would be fenced to exclude livestock from natural resource areas and to protect surrounding private property from the public. The type and style of minimum standard fencing would be as described under baseline conditions (see Section 1.4.1). Provisions would be made for allowing off-stream livestock watering or access zones through the fenced areas for watering where this would be required by the adjacent landowner to continue grazing activities.

Map A-1 in the back of the EIS shows projected locations of 100-year flood areas. The 100-year floodplain would be inundated on average once every 100 years with one percent chance of inundation in any year. Typical 100-year floodplain depths would be 0.5 to 1.5 feet; typical floodplain velocities would be about 1.0 feet per second. Duration of inundation would be determined by releases from Jordanelle Dam. The duration of peak discharge releases from the dam would be from one to seven days; inundation in the floodplain could be expected to last for about one week beyond the peak release period for the 100-year flood, and for shorter periods during smaller floods. Future urban development in the 100-year floodplain outside federally-acquired areas would be regulated by Wasatch County floodplain management ordinances. Inhabitable structures would be required to be elevated (e.g., on fill material) above the 100-year flood water surface level in accordance with county and other ordinances.

1.5.4 Construction Procedures

1.5.4.1 Typical Construction Procedures

The Proposed Action would be constructed in phases, generally from upstream to downstream. A cofferdam (a temporary small dam typically constructed of native material and/or plastic tubing or sheeting) would be constructed in the existing channel at each new meander to isolate the river flow from the new channel construction area. New river channel segments would be constructed one at a time. The new river channel segments would initially receive small amounts of water to wash sediments into larger flows of the Provo River. This procedure would be repeated at each constructed river segment.

Salvageable materials excavated from the existing channel would be sorted and stockpiled on site for use in new channel construction. This includes boulders and large rocks from the existing levees; river cobble from the existing river bottom; woody material from existing vegetation on the banks (root wads, tree trunks and large branches); and topsoil.

Construction would be scheduled such that, to the extent possible, construction timing of new channel segments would minimize impacts. Depending on hydrologic conditions and Jordanelle Reservoir levels, Jordanelle Reservoir releases could be reduced during construction to facilitate equipment ingress/egress and construction activity. No plan for this has been developed at this time, and any such plan would have to be approved by downstream irrigators and other water rights holders, as well as by resource management and regulatory agencies.

Jordanelle Reservoir water releases would be managed for approximately 5 years following construction to promote riparian forest development. This would allow riparian vegetation to become well-established along the channel banks. Moderate overbank flooding would be allowed outside the channel to encourage the development of riparian vegetation in the floodplain. A specific reservoir management plan has not been formulated at this time and would be dependent on reservoir storage conditions at the time of construction. The reservoir management plan would assure that all water rights and downstream water delivery obligations as described under baseline would be met during construction.

The following equipment could be used to construct the Proposed Action:

- Backhoe - Cat 426 or equivalent
- Compactor - Cat 816B or equivalent
- Dozer - Cat D7 or equivalent
- Excavator - Cat 235 or equivalent
- Excavator - Cat 245 or equivalent
- Loader - Cat 966C or equivalent
- Motor Grader - Cat 14G or equivalent
- Pickup
- Scraper - Cat 621 or equivalent
- Truck - Rear Dump
- Truck - Flatbed
- Truck - Mechanics

Locations for stockpiling materials onsite would be determined during design and construction, with close coordination among landowners, the proper agencies and the contractor, and would be selected to minimize impacts on existing land uses and environmental features.

Construction spoil would be disposed off-site within the Heber Valley. Local gravel pits would be contracted for receipt of construction spoil consisting of earth materials that do not meet design specifications for use in building the project.

Construction would not affect existing utilities. No utilities are buried in the construction zone, and suspended utilities crossing the river would be protected in place during and after construction.

1.5.4.2 Typical Noise Levels and Air Emissions

Table 1-8 shows the typical noise levels associated with operating the types of equipment required for construction of the Proposed Action.

Table 1-9 shows the typical air emissions associated with the types of construction equipment that would be used to construct the Proposed Action.

1.5.4.3 Temporary Construction Access

Construction workers and equipment would gain access to the river corridor at public road access points. An additional temporary access road would be constructed along the Heber Valley Railroad/State Parks ROW in Reach 2. Negotiations would be conducted with landowners to determine whether temporary construction access could be obtained in additional areas if needed.

A minimum 50-foot construction access zone would be established along both sides of the entire reconstructed channel/floodplain. The Core Area has been designed to include sufficient area to incorporate construction access requirements within the acquired property. Except in the upper portion of Reach 4, acquisition of baseline corridor plus existing federal easements would provide authority for channel construction and worker and equipment access. Proposed construction access areas are shown on Map A-3 in the map pocket in the back of the EIS. Section 1.5.3.2 discusses issues related to acquiring construction access areas.

Table 1-8
Typical Noise Levels Associated with Construction Equipment Under the Proposed Action and PRRP Alternatives

Temporary Construction Equipment	Horsepower	Daily Usage	Noise Levels	
			Range of Noise Level @ 50 ft (in dBA)*	Nominal Noise Level, Leq @ 50 ft (in dBA)
Air Compressor	85	8 hours	68 to 87	81
Backhoe-Cat 426	70	8 hours	78 to 84	79
Compactor-Cat 816B	210	8 hours	72 to 96	84
Compactor-Vibratory	100	8 hours	78 to 84	79
Compactor-14 in. Whacker	5	8 hours	84 to 90	86
Crane-25 Ton	160	8 hours	75 to 95	80
Crane-60 Ton	200	8 hours	75 to 95	80
Dozer-Cat D7	215	8 hours	72 to 96	86
Excavator-Cat 235	215	8 hours	71 to 93	85
Excavator-Cat 245	325	8 hours	71 to 93	85
Forklift	130	8 hours	76 to 85	80
Generator	40	8 hours	69 to 81	74
Loader-Cat 966C	200	8 hours	71 to 96	82
Motor Grader-Cat 14G	200	8 hours	73 to 95	85
Pickup (on site use only)	130	50 mi/day	76 to 85	80
Scraper-Cat 621	330	8 hours	73 to 95	88
Scraper-Cat 623	330	8 hours	73 to 95	88
Trencher	500	8 hours	72 to 96	86
Truck - Concrete Mixer	250	50 mi/day	70 to 90	85
Truck - Concrete Pump	200	8 hours	74 to 84	82
Truck - Rear Dump	350	50 mi/day	70 to 92	85
Truck - Flatbed	175	50 mi/day	76 to 85	80
Truck - Mechanics	175	50 mi/day	76 to 85	80
Truck - Pipe	250	50 mi/day	70 to 92	85
Truck - Water	250	8 hours	70 to 92	85
Water Tanker	450	8 hours	79 to 88	84

Notes:
*dBA is A-weighted decibel, which is a scale measuring human response to loudness.

Table 1-9
Typical Air Emissions Associated With Construction Equipment Under the Proposed Action and PRRP Alternatives

Equipment Type	Typical Emissions Based on 8 Hours of Operation Per Day		
	NOx (lb/month)	SOx (lb/month)	PM10 (lb/month)
Air Compressor	163.2	27.2	13.6
Backhoe - Cat 426	704.0	64.0	48.0
Compactor - Cat 816B	806.4	67.2	50.4
Compactor - Vibratory	384.0	32.0	24.0
Compactor - 14 in. Wacker	0.5	0.4	6.8
Concrete Vibrator	384.0	32.0	24.0
Crane - 25 ton	281.6	51.2	38.4
Crane - 60 Ton	352.0	64.0	48.0
Dozer - Cat D7	791.2	68.8	34.4
Excavator - Cat 235	421.1	68.8	51.6
Excavator - Cat 245	1248.0	110.2	78.0
Forklift	644.8	41.6	31.2
Generator	115.2	12.8	6.4
Loader - Cat 966C	704.0	64.0	48.0
Motor Grader - Cat 14G	672.0	64.0	64.0
Pickup	2.3	0.6	15.0
Scraper - Cat 621	1003.2	105.6	79.2
Scraper - Cat 623	1003.2	105.6	79.2
Trencher	1760.0	160.0	120.0
Truck - Concrete Mixer	960.0	80.0	40.0
Truck - Concrete Pump	768.0	64.0	48.0
Truck - Rear Dump	1344.0	112.0	84.0
Truck Flatbed	672.0	56.0	42.0
Truck - Mechanic's	672.0	56.0	42.0
Truck - Pipe	960.0	80.0	60.0
Truck - Water	960.0	80.0	60.0
Water Tanker	1728.0	144.0	108.0

1.5.5 Maintenance Procedures and Management of the Project Area

The Proposed Action would require long-term annual monitoring of channel stability and revegetation conditions. Routine annual inspections of the channel would be required to assure that lateral and vertical erosion forces were not excessively endangering channel stability, and that revegetation projects were successful. The Mitigation Commission would develop a management agreement with an appropriate entity to provide management, maintenance and security, as described in Section 1.4.2.

High stress zones on newly constructed channel banks would be inspected often during the first five years after construction to assure that erosion was being managed. Vegetation planted for bank stabilization would be carefully monitored for successful rooting and propagation. A program would be developed for controlling growth of noxious plants in revegetated areas. Noxious weed control is discussed in Section 1.9.6.1. Appendix A presents a noxious weed control plan that would be used to control weeds in the constructed areas.

The Proposed Action does not include any new structures that would have to be maintained, repaired or replaced on a regular basis after a mature riparian zone has been established. Maintenance of irrigation diversions and retained dikes would continue to be the responsibility of the irrigation companies or private irrigators. Coordination would occur with the Provo River Water Users Association and the USBR regarding any maintenance responsibilities or contracts the Provo River Water Users Association may have that might be affected by the Proposed Action.

Management of the Proposed Action Project Area would be similar to that described in Section 1.4.2 for baseline conditions. Because more land would be acquired under the Proposed Action for habitat restoration and wildlife habitat protection purposes, additional management objectives would be developed, which could lead to closure of some portions of the Project Area at certain times to protect sensitive wildlife habitats or species. The Utah Division of Wildlife Resources and other involved agencies would provide specific advice for management of the corridor for ecosystem restoration objectives. Table 1-14 in Section 1.7.5 depicts estimated labor and costs for operation, maintenance and management of the Proposed Action.

1.6 Detailed Description of the Existing Channel Modification Alternative — Physical Features and Other Characteristics

The Existing Channel Modification Alternative would attempt to enhance river mechanics, fish habitat and other environmental features and values by making channel modifications within the existing Provo River channel or leveed area. The Project Area consists of the Core Area, which for this alternative would extend to the present construction and flood easement boundary. There is no Expanded Restoration Area for this alternative. Table 1-10 in this section, and Map A-2 in the map pocket at the back of the EIS, describe the Existing Channel Modification Alternative improvements. Figure 1-2 depicts a schematic cross-section of this alternative.

1.6.1 Channel Features

1.6.1.1 Features Common to All Reaches

A step-pool or rapid-pool channel would be developed between the existing levees wherever this width is sufficient to accommodate the peak 100-year water discharge. Existing levees would be removed and setback levees would be constructed near the edge of the existing construction and flood easement or federal land boundary where the leveed area is not wide enough to support this design. Map A-2 in the map pocket at the back of the EIS shows locations where existing levees would be retained and where setback dikes would be constructed.

The constructed channel would be composed of a sequence of pools, rapids or riffles, and steps (nearly vertical drops of about 1 foot with a 1.5 ft deep pool at the base). Riffles and pools would have similar cross-section geometries in this alternative. Rapids and riffles under low-water conditions would provide a minimum hydraulic depth of one foot at the minimum flow of 125 cfs and maintain flow contact with the channel banks at seasonally higher flow. The compound riffle cross-section would not

Table 1-10
Summary of Existing Channel Modification Alternative Improvements
Page 1 of 3

PRRP Study Reach	Improvements
Reach 1 Deer Creek Reservoir to End of Levees	• No improvements
Reach 2 End of Levees to Casperville	• Modify 5,500 feet of existing channel • Remove western dike along 3,640 feet of existing channel • Construct 4,000 feet of 2 ft high setback dikes • Install 140 feet of special bank stabilization • Revegetate 12.4 acres of disturbed area • Reconstruct Lower Charleston Diversion • Protect Winterton Bridge, gas line, railroad, and Casper Bridge crossings
Reach 3 Casperville to Island Ditch Diversion	• Modify 7,510 feet of existing channel • Install 120 feet of special bank stabilization • Remove western dike along 4,700 feet of existing channel • Construct 5,000 feet of 2 ft high setback dikes • Revegetate 26.1 acres of disturbed area • Reconstruct Everett Slough Diversion • Extend Everett Slough Ditch 520 feet upstream • Protect Midway Road bridge and gas pipeline crossing • Reconstruct Island Ditch Diversion
Reach 4 Island Ditch Diversion to End of Levees	• Modify 6,920 feet of existing channel • Install 980 feet of special bank stabilization • Revegetate 2.6 acres of disturbed area
Reach 5 End of Levees to Probst Diversion	• Modify 4,440 feet of existing channel • Revegetate 24.5 acres of disturbed area

Table 1-10
Summary of Existing Channel Modification Alternative Improvements
Page 2 of 3

PRRP Study Reach	Improvements
Reach 6 Probst Diversion to River Road	• Modify 8,720 feet of existing channel • Install 480 feet of special bank stabilization • Remove eastern dike along 1,330 feet of existing channel • Remove western dike along 2,930 feet of existing channel • Construct 2,800 feet of 2 foot-high setback dikes • Construct 1,400 feet of 3 foot-high setback dikes • Revegetate 22.1 acres of disturbed area • Reconstruct Probst Diversion 200 feet upstream • Extend Probst Diversion ditch 300 feet upstream • Reconstruct Gertsch Diversion • Reconstruct Wilson Diversion • Protect River Road Bridge
Reach 7 River Road to Baum Diversion	• Modify 4,730 feet of existing channel • Remove western dike along 1,300 feet of existing channel • Construct 1,300 feet of 2 foot-high setback dikes • Install 80 feet of special bank stabilization • Revegetate 14.1 acres of disturbed area • Reconstruct Midway Diversion • Extend ditch to Baum Diversion 370 feet upstream • Reconstruct Baum Diversion 250 feet upstream
Reach 8 Baum Diversion to Valeo Diversion	• Modify 4,600 feet of existing channel • Remove eastern dike along 1,550 feet of existing channel • Remove western dike along 740 feet of existing channel • Construct 80 feet of 2 foot-high setback dikes • Construct 250 feet of 3 foot-high setback dikes • Construct 110 feet of buried grade control structure • Construct 240 feet of special bank stabilization • Revegetate 19.6 acres of disturbed area • Reconstruct Wasatch Diverson

Table 1-10
Summary of Existing Channel Modification Alternative Improvements
Page 3 of 3

PRRP Study Reach	Improvements
Reach 9 Valeo Diversion to Old U.S. 40	• Modify 8,460 feet of existing channel • Remove eastern dike along 5,730 feet of existing channel • Construct 2,000 feet of 2 foot-high setback dikes • Construct 1,000 feet of 4 foot-high setback dikes • Construct 350 feet of buried grade control structure (2) • Revegetate 28.2 acres of disturbed area • Reconstruct Condie Diversion 130 feet to east • Protect quarry bridge, gas pipeline, private bridge, and Old U.S. 40 bridge crossings

Notes:

1. Channel modifications would consist of regrading the existing cross section (see Figure 1-1) and developing a rapid-pool or step-pool sequence.
2. Special bank stabilization would be large rock buried in the channel bank at bends or other locations with high erosion potential.
3. Diversion structure reconstruction would be necessary because of grade and geometry changes; diversions must pass 125 cfs in the main channel.
4. Bridges and other crossings would be protected by placing large rock around abutments to prevent scour.

only provide increased flow depth during the minimum flow condition but would provide cross-sectional diversity to promote the growth and maintenance of a healthy aquatic habitat. Large rocks and boulders placed and anchored within the riffles would serve as local roughness elements to promote riffle stability and provide fish passage during the higher runoff and accompanying higher velocity flood events. The placement of boulders would be performed in patterns that direct the main current to the center of the cross-section and relieve stress on the banks. Figure 1-10 depicts a plan view of a typical segment of channel as it would be built under this alternative.

The proposed pool section would provide adequate flow depth and quiet water at the base and top of each riffle zone. The lower velocities within the pool sections would result in a finer bed material than the riffles.

The channel geometry would provide interaction between the main channel and floodplain at recurrence intervals greater than the 1.5-year flow event (1,200 cfs). Volume 2 of the PRRP Technical Report (CUWCD 1994) presents schematics of the rapid and pool channel sections used in the Existing Channel Modification Alternative hydraulic design.

Table 1-11 summarizes channel and floodplain reach characteristics for the Existing Channel Modification Alternative. Typical channel widths at bankfull levels would vary from approximately 65 to 100 feet, incorporating both riffles and pools. Riffles would range from 65 to 80 feet in top-width. There would be a 15 to 25 percent increase in top-width of the adjacent pool section reflecting a range between 80 and 100 feet. Pool widths would be increased to accommodate the construction of point bars in mildly meandering sections and to allow for flow expansion and energy dissipation of the high velocity flows descending across the riffles.

Rock structures would be placed at the upstream and downstream ends of each riffle and rapid to retain river bed elevations. Where larger grade changes are required, a maximum of 1-foot of drop would be constructed downstream of the rock structures, with a minimum of a 1.5-ft deep plunge pool below the structures to assist in upstream fish migration.

The topography and valley slope generally act as the primary controls dictating channel grade along each reach. The location of bridges, points of irrigation diversion, and tributary confluences act as local controls on bottom elevations in the deepest part of the channel. These bottom elevations would be controlled at or near existing grade to minimize the relocation of diversions or off-site disturbance.

Protection of the bottom of streambank slopes and natural channel revetment would be an integral part of the channel design to control erosion of the bed and banks. Minimum sediment movement out of the pools is anticipated because of the lower water velocities in the pools. Upstream sediment production must be minimized to ensure the longevity of the individual pools. Although the geomorphic basis of the design minimizes bank shear stress throughout the majority of the impact area of influence, bank protection and stabilization of the riffles would be essential. Natural bank revetment, including selectively placed boulders, root wads and vegetation mats, would be incorporated along critical reaches.

Existing irrigation gates may have to be modified or reconstructed as necessary as part of baseline conditions in order to pass the minimum 125 cfs baseflow while diverting the designated water right during low flow periods. Modification to these diversion facilities would have to be coordinated with the requirements of the Existing Channel Modification Alternative relative to necessary modifications to the channel grade and cross-section to avoid reconstructing the diversion facilities more than once. Existing concrete and log sills (diversion dams) would be replaced with vortex rock weirs or similar features to control the river bed elevation and water surface at the diversion points. The large drops below the existing diversion sills would be graded out as part of the channel reconstruction.

Crossings by roads, railroads, and utility pipelines would remain intact. Abutments and piers would be protected with placement of large rock salvaged from the existing levee riprap.

1.6.1.2 Specific Reach Features

Wider pools and riffles would be used in the downstream sections (Reaches 2 and 3), and narrower pools and riffles would be used in the upstream sections (Reaches 5-8). The width of pools and riffles is primarily a function of channel slope.

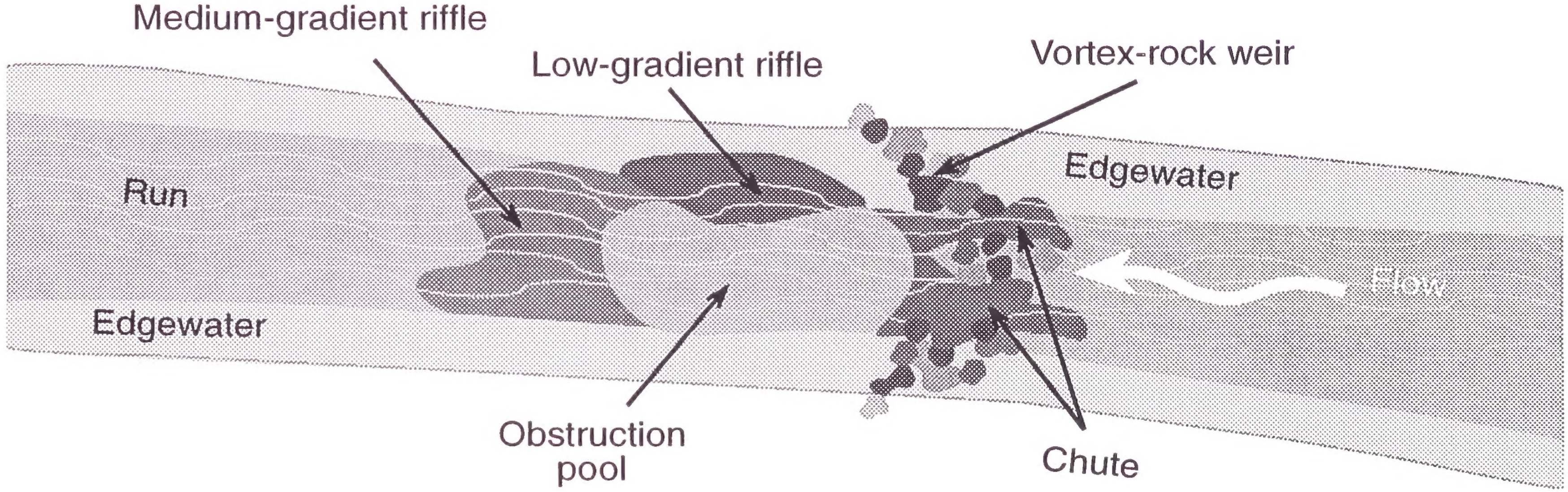


Figure 1-10
Schematic Drawing of Typical Segment of Provo River Channel
Under the Existing Channel Modification Alternative
(modified from Rabeni et.al. 1993)

Table 1-11
Existing Channel Modification Alternative Channel and Floodplain Reach Characteristics

									Mean Channel Velocity (ft/sec)					
Reach	Channel Length (ft)	Bankfull Width (ft)		Floodplain Width (ft)	Channel Slope (ft/ft)		Bankfull Depth (ft)		Base Flow		Bankfull Discharge		100-Year Discharge	
		Riffle	Pool		Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool	Riffle	Pool
2	5,500	80	100	160	0.010	0.003	3.7	6.0	2.2	1.1	5.5	3.8	7.0	5.6
3	7,510	80	100	160	0.010	0.003	3.7	6.0	2.2	1.1	5.5	3.8	7.0	5.6
4	6,920	65	80	720	0.015	0.005	3.6	6.1	2.6	1.6	6.9	4.6	7.7	6.8
5	4,440	65	80	220	0.015	0.005	3.6	5.9	2.8	2.0	7.5	5.1	9.4	7.0
6	8,720	65	80	180	0.015	0.005	3.6	5.9	2.8	2.0	7.5	5.1	9.4	7.0
7	4,730	65	80	160	0.015	0.005	3.6	5.9	2.8	2.0	7.5	5.1	9.4	7.0
8	4,600	65	80	180	0.015	0.005	3.6	5.9	2.8	2.0	7.5	5.1	9.4	7.0
9	8,460	80	100	130	0.020	0.005	2.9	5.7	2.6	1.4	7.2	4.3	9.4	6.1

Notes:

Base Flow = 125 cfs
Bankfull Discharge = 1,200 cfs
100-Year Discharge = 2,860 cfs

Reach 4 is a unique section because there are no existing dikes. In this section, the existing channel would be stabilized in some areas to promote a single thread channel. Floodplain flows would be unrestricted in Reach 4 within the existing flood easement. A 65-foot wide channel section would be essential to maintain sediment transport conditions consistent with upstream and downstream reaches. A fixed channel alignment would be developed under this alternative. The fee title acquisition under baseline conditions would be more than adequate to contain all channel improvements needed under this alternative within Reach 4. The baseline floodplain and fee-title corridor width would range from 600 to 1,000 feet, and be contained entirely within the existing federal government flood easements. Channel design in Reach 4 would utilize the existing active channel features as much as possible. Changes in proposed alignment and profile would be necessary during final design to maximize utilization of active channel features because the channel is expected to continue to shift in the future as it adjusts to changed upstream conditions under this alternative. It would not be adequate to just allow Reach 4 to adjust itself as with the Proposed Action because of the higher stream flow velocities and sediment loads under this alternative, and the narrower floodplain width that would be acquired.

Reach 9 typically would incorporate a wider channel cross-section (80 foot top-width in riffles, 100 foot top-width in pools) to reduce the scour potential of the sediment-free or "hungry" water releases from Jordanelle Reservoir.

1.6.2 Floodplain Features

Where a rapid-pool channel cannot be constructed within the confines of the existing dikes, the dikes either would be removed and sub-excavated to develop the required 100-year flood capacity, or low relief setback dikes would be constructed. Setback dikes would have a typical height of 2 to 4 feet and a top width of 15 to 30 feet, as shown in Figure 1-6 in Section 1.5. Wider top-widths would not be used for this alternative because the setback dikes would be located near the river channel rather than in pastures or other agricultural lands. Every effort would be made to minimize disturbance of significant riparian habitat where existing dikes would be removed and setback dikes would be constructed.

In limited locations where dikes would be relocated outward from the channel as part of the Existing Channel Modification Alternative, the existing (under baseline conditions) public access corridor would be expanded so it would incorporate the new dike. This would occur in Reaches 2 and 3. The Core Area corridor would serve as a major portion of the construction easement during construction of the Existing Channel Modification Alternative features. The Core Area would be fenced upon completion as described in section 1.4.2 under baseline conditions. Minor construction easements would be required in addition to the Core Area (existing federal flood and construction easements along the river channel would be converted to fee title acquisition under baseline). Where the channel is immediately adjacent to a steep hillside (e.g., the lower portion of Reach 7), the construction easement would consist of 100 feet on the valley side of the channel. Fencing requirements for newly acquired public lands would be the same as described in Section 1.5.2.6. Map A-4 in the map pocket at the back of the EIS shows proposed acquisition areas for the Existing Channel Modification Alternative.

1.6.3 Changes in Ownership and Land Use

1.6.3.1 Land Ownership

This alternative would require fee title acquisition of 7.6 acres in addition to baseline. Construction easements would be required on 14.1 acres of private property

1.6.3.2 Land Use

Construction vehicles and equipment would use temporary access roads to move from existing public roads to construction areas throughout the project area. The majority of these roads would be situated along the existing and proposed channel alignments or along the existing dikes, and would become part of the area acquired for the Core Area. Land uses of all types would be temporarily restricted on access roads during construction. Less than one acre of existing lands outside the Core Area would be needed for construction access roads. Existing and planned land uses could resume after construction on access roads not in the acquired Core Area.

The Project Area would be fenced to exclude livestock from natural resource areas and to protect

surrounding private property from the public. The type and style of minimum standard fencing would be as described under baseline conditions (see Section 1.4.1.3). Provisions would be made for allowing livestock crossing or access zones through the fenced areas where this would be required by the adjacent landowner to continue grazing activities.

Map A-2 in the back of the EIS shows projected locations of 100-year flood areas. The 100-year floodplain would be inundated on average once every 100 years with one percent chance of inundation in any year. Typical 100-year floodplain depths would be 0.5 to 1.5 feet; typical floodplain velocities would be about 1.0 feet per second. Duration of inundation would be determined by releases from Jordanelle Dam. The duration of peak discharge releases from the dam would be from one to seven days; inundation in the floodplain could be expected to last for about one week beyond the peak release period for the 100-year flood, and for shorter periods during smaller floods. Future urban development in the 100-year floodplain outside federally-acquired areas would be regulated by Wasatch County floodplain management ordinances. Inhabitable structures would be required to be elevated (e.g., on fill material) above the 100-year flood water surface level in accordance with county and other ordinances.

1.6.4 Construction Procedures

1.6.4.1 Typical Construction Procedures

Construction of the Existing Channel Modification Alternative would proceed from upstream to downstream, with a cofferdam (see Section 1.5.4.1) used to keep portions of the existing channel area dry during construction. The cofferdam would be placed near the center of the channel to isolate one side of the river channel and bank from active flow. After construction is completed on one side of the channel, flow would be introduced to it gradually. Eventually, the entire river flow would be turned into the completed section, and channel construction would proceed on the opposite side of the river. After work has been completed on one construction segment, the cofferdam would be moved downstream to the next construction segment.

Salvageable materials from the existing channel would be sorted and stockpiled on site for use in new channel construction. Salvageable materials include boulders and large rocks from the existing levees; river cobble from the existing river bottom; woody material from existing vegetation on the banks (root wads, tree trunks and large branches); and topsoil.

Timing of construction would be scheduled such that, to the extent possible, construction in the existing channel itself would not occur during the high flow period in May through July. Depending on hydrologic conditions and Jordanelle Reservoir levels, Jordanelle Reservoir water releases could be reduced during construction to facilitate equipment ingress/egress and construction activity. No plan for this has been developed at this time, and any such plan would have to be approved by downstream irrigators, other water rights holders and environmental agencies, and would have to satisfy all water rights obligations.

Jordanelle Reservoir water releases would be managed for approximately 5 years following construction to prevent the occurrence of severe flows. This would allow vegetation to become well-established along the channel banks. Minor flooding would be allowed outside the channel to encourage the development of riparian vegetation in the floodplain. A specific reservoir management plan has not been formulated at this time and would be dependent on reservoir storage conditions at the time of construction.

Construction equipment and stockpiling procedures for the Existing Channel Modification Alternative would be the same as those described in Section 1.5.4.1 for the Proposed Action. In addition, stockpiling, staging and construction activity areas would be confined as much as possible to the side of the channel where setback dikes would be constructed to minimize adverse impacts on existing riparian vegetation.

Existing utilities crossing the river are suspended and would be protected in place during and after construction.

1.6.4.2 Typical Noise Levels and Air Emissions

Typical noise levels and air emissions for the construction equipment required to construct the Existing Channel Modification Alternative are

presented in Tables 1-8 and 1-9 in Section 1.5.4.2 of this EIS.

1.6.4.3 Temporary Construction Access

Temporary construction access would be needed on lands comprising 14.1 acres under the Existing Channel Modification Alternative. Disturbed areas outside the project Core Area would be restored to prior conditions and uses. Access easements would be acquired from land owners. Temporary construction access issues for the Existing Channel Modification Alternative would be the same as described in Section 1.5.4.3 for the Proposed Action.

1.6.5 Maintenance Procedures and Management of the Project Area

Maintenance procedures for the Existing Channel Modification Alternative would be the same as described in Section 1.5.5 for the Proposed Action. Management of the corridor would be the same as described under baseline conditions (Section 1.4.2). Table 1-14 depicts estimated labor and costs associated with operation, maintenance and management of this alternative.

1.7 Detailed Description of the Instream Structures Alternative — Physical Features and Other Characteristics

Clearwater BioStudies, Inc. prepared an Aquatic Habitat Improvement Plan for the Provo River below Jordanelle Dam (Clearwater BioStudies, Inc. 1991). This plan, prepared for the U.S. Forest Service (USFS) under contract with the Bureau of Reclamation, identified habitat enhancement structures suitable for use in the present channel. The assumptions for the Aquatic Habitat Improvement Plan were established to be consistent with the requirements of the Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System. The plan developed by Clearwater BioStudies, Inc. serves as the basis for the Instream Structures Alternative. More specific details for accomplishing the habitat improvements would be developed in final design of this alternative.

The Instream Structures Alternative would include minor modifications to localized features in the Provo River. No modifications would be made to the channel, cross-section or alignment, levees, floodplains, diversion structures or bridges for the purpose of river restoration. Fish habitat structures would be constructed within the existing river channel. Table 1-12 summarizes the improvements of the Instream Structures Alternative by reach and Figure 1-11 represents a schematic of a typical river section. Map 1-2 in Section 1.3.4 shows portions of the river reaches where the Instream Structures Alternative would be implemented. Angler access would be provided along the river corridor as part of baseline conditions; additional lands would not be acquired under this alternative.

The PRRP Technical Report (CUWCD 1994) refers to this alternative as the No Action Alternative.

1.7.1 Channel Features

This alternative would consist of installing a variety of fish habitat enhancement structures in the existing Provo River channel. Based on detailed field investigations, 233 site-specific enhancement measures were designed to address habitat limitations within the Provo River corridor. These measures are distributed among a total of 16 stream sections (subreaches) within PRRP Reaches 2, 3, 5, 6, 7, 8, and 9. No structures were proposed for Reach 1 because the current habitat is fair to good, and the channel is moderately unstable because of Deer Creek Reservoir backwater effects and periodic inundation by the reservoir pool. Reach 4 was not considered amenable to habitat enhancement because of channel instability and the existing multiple channel features.

The overall habitat enhancement plan consists of 70 cover logs, 11 depositional structures, 2 logs with root wads, 17 "organic riprap" treatments, 54 sets of rock clusters, 24 rock deflectors, 7 rock weirs, 46 rock diagonals, 1 rock diagonal with a wing, and 1 excavation treatment. Sketches of several of the more common habitat enhancement structures are shown in Figures 1-12 to 1-15. Plans for locating and constructing these structures are included in the Aquatic Habitat Improvement Plan for the Provo River below Jordanelle Dam (Clearwater BioStudies, Inc. 1991). The objectives of these various structures would be to provide new pool habitat, hiding cover, high flow refuge areas, scour holes, and

Table 1-12
Summary of Instream Structures Alternative Improvements

Page 1 of 2

PRRP Study Reach	Improvements
Reach 1 Deer Creek Reservoir to End of Levees	• No Improvements
Reach 2 End of Levees to Casperville	• 8 Rock Diagonals • 1 Rock Diagonal with Wing • 7 Rock Clusters • 3 Rock Deflectors • 16 Cover Logs
Reach 3 Casperville to Island Ditch Diversion	• 8 Rock Diagonals • 9 Rock Clusters • 7 Rock Deflectors • 23 Cover Logs • 2 Organic Rip-Rap Treatments
Reach 4 Island Ditch Diversion to End of Levees	• No Improvements
Reach 5 End of Levees to Probst Diversion	• 6 Rock Diagonals • 6 Rock Clusters • 2 Rock Deflectors • 5 Cover Logs • 4 Organic Rip-Rap Treatments
Reach 6 Probst Diversion to River Road	• 17 Rock Diagonals • 15 Rock Clusters • 8 Rock Deflectors • 11 Cover Logs • 8 Organic Rip-Rap Treatments • 6 Depositional Structures • 1 Excavation Treatment
Reach 7 River Road to Baum Diversion	• 6 Rock Diagonals • 8 Rock Clusters • 1 Rock Deflector • 4 Rock Weirs • 5 Cover Logs • 2 Depositional Structures

Table 1-12
Summary of Instream Structures Alternative Improvements

Page 2 of 2

PRRP Study Reach	Improvements
Reach 8 Baum Diversion to Valeo Diversion	• 1 Rock Cluster • 1 Rock Deflector • 5 Cover Logs • 2 Organic Rip-Rap Treatments
Reach 9 Valeo Diversion to Old U.S. 40	• 1 Rock Diagonal • 8 Rock Clusters • 2 Rock Deflectors • 3 Rock Weirs • 5 Cover Logs • 1 Organic Rip-Rap Treatment • 3 Depositional Structures • 2 Logs with Rootwad

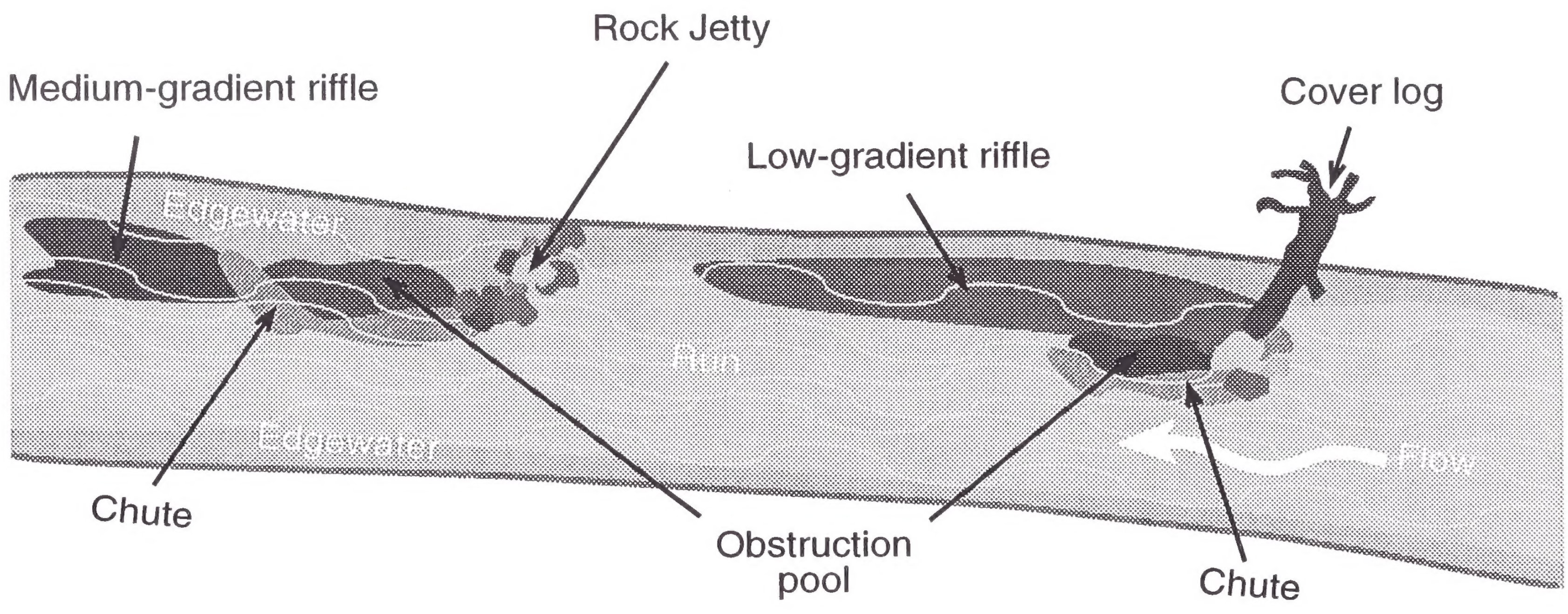


Figure 1-11
Schematic Drawing of Typical Segment of Provo River Channel
Under the Instream Structures Alternative
(modified from Rabeni et.al. 1993)

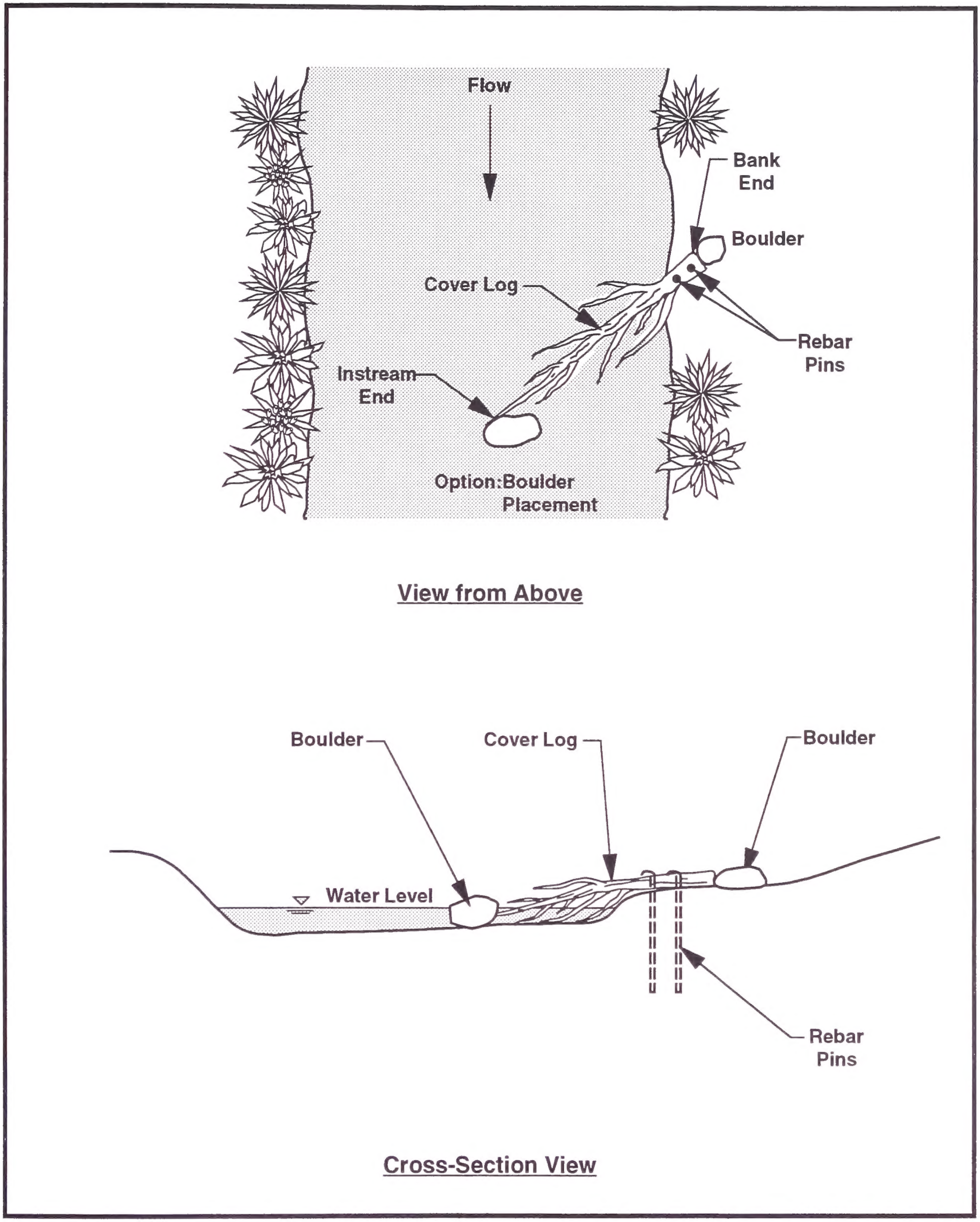


Figure 1-12
Fish Habitat Enhancement Cover Log Structure

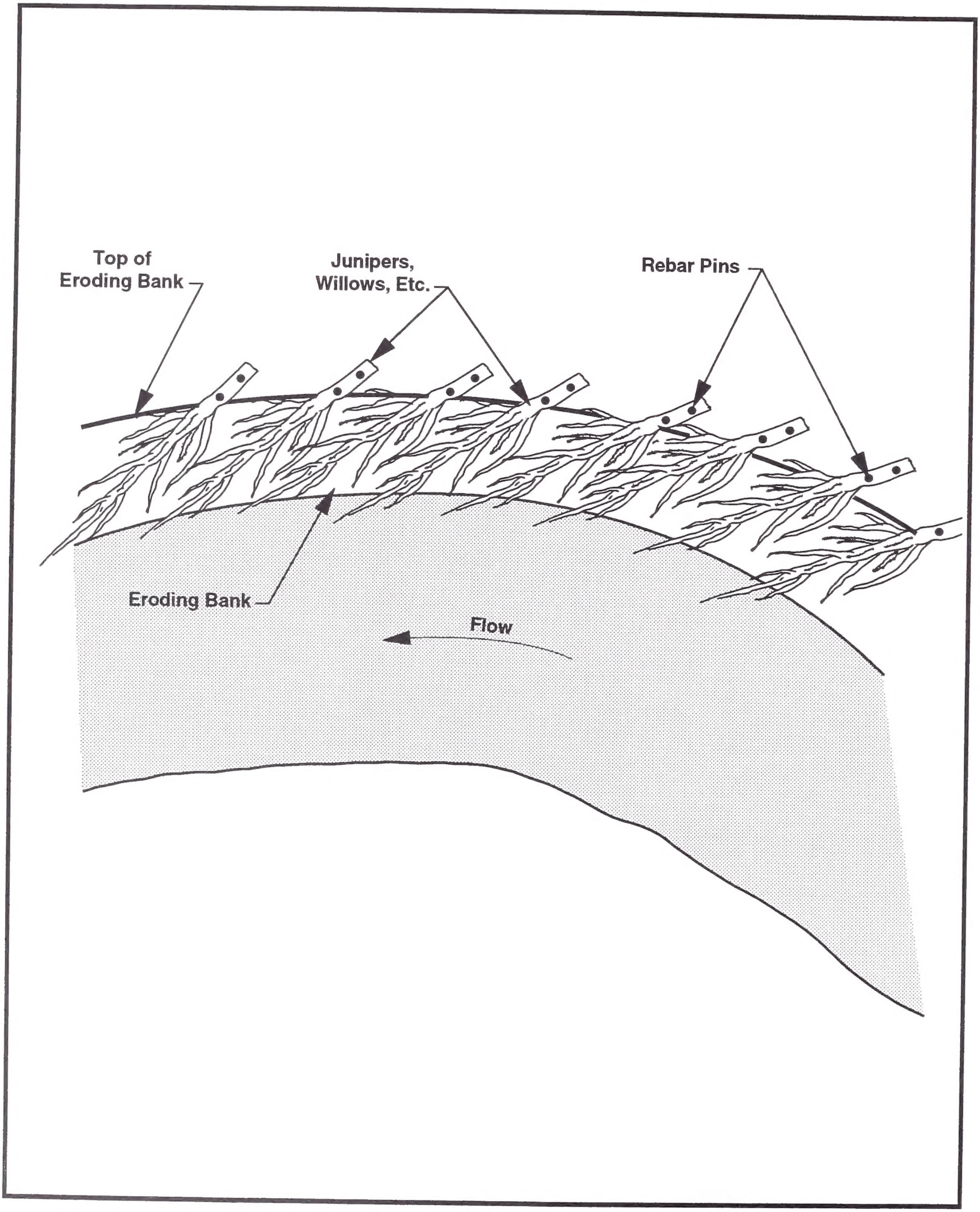


Figure 1-13
Schematic of Organic Riprap After Reconstruction

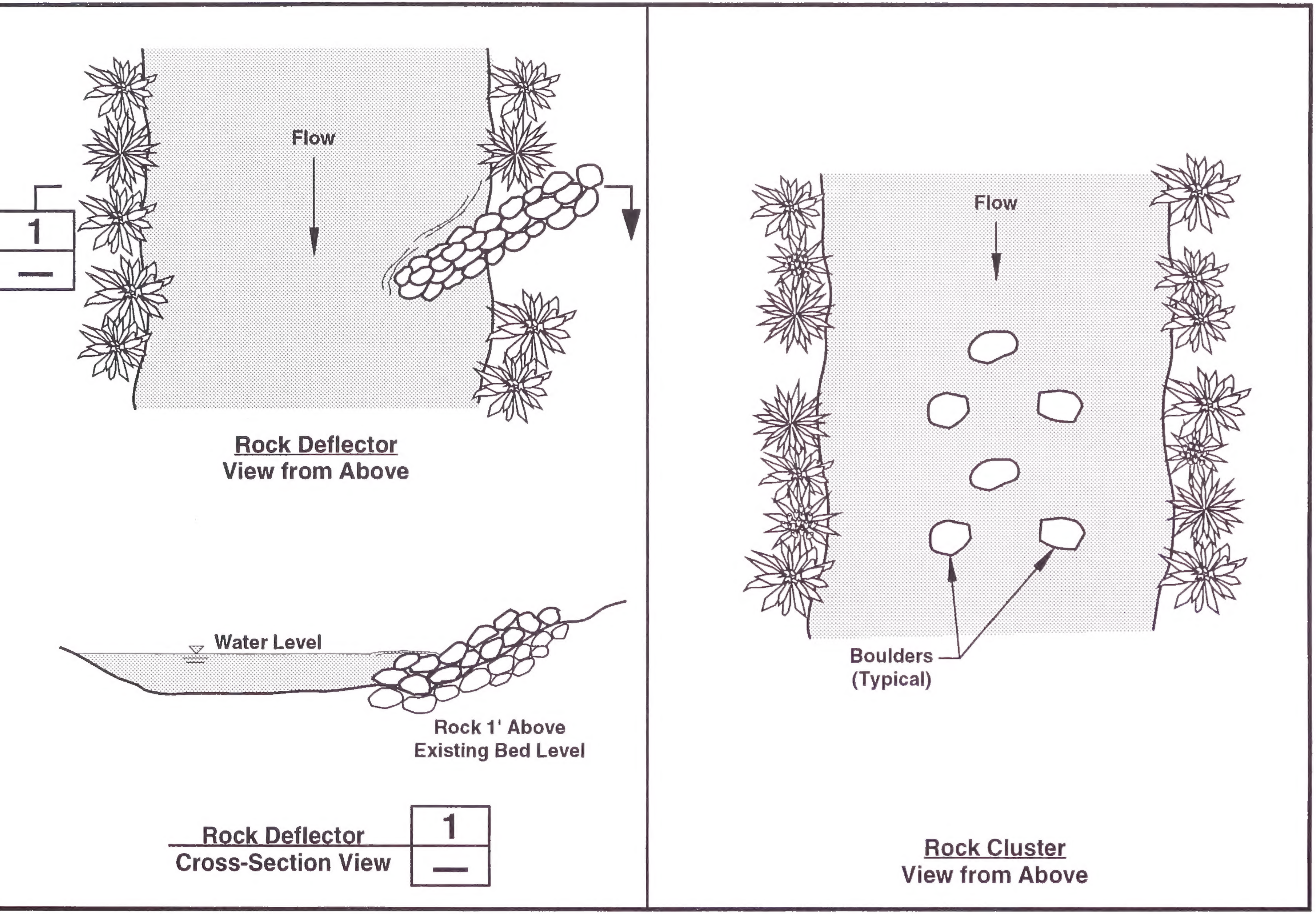


Figure 1-14
Schematic of Rock Deflector and Rock Cluster

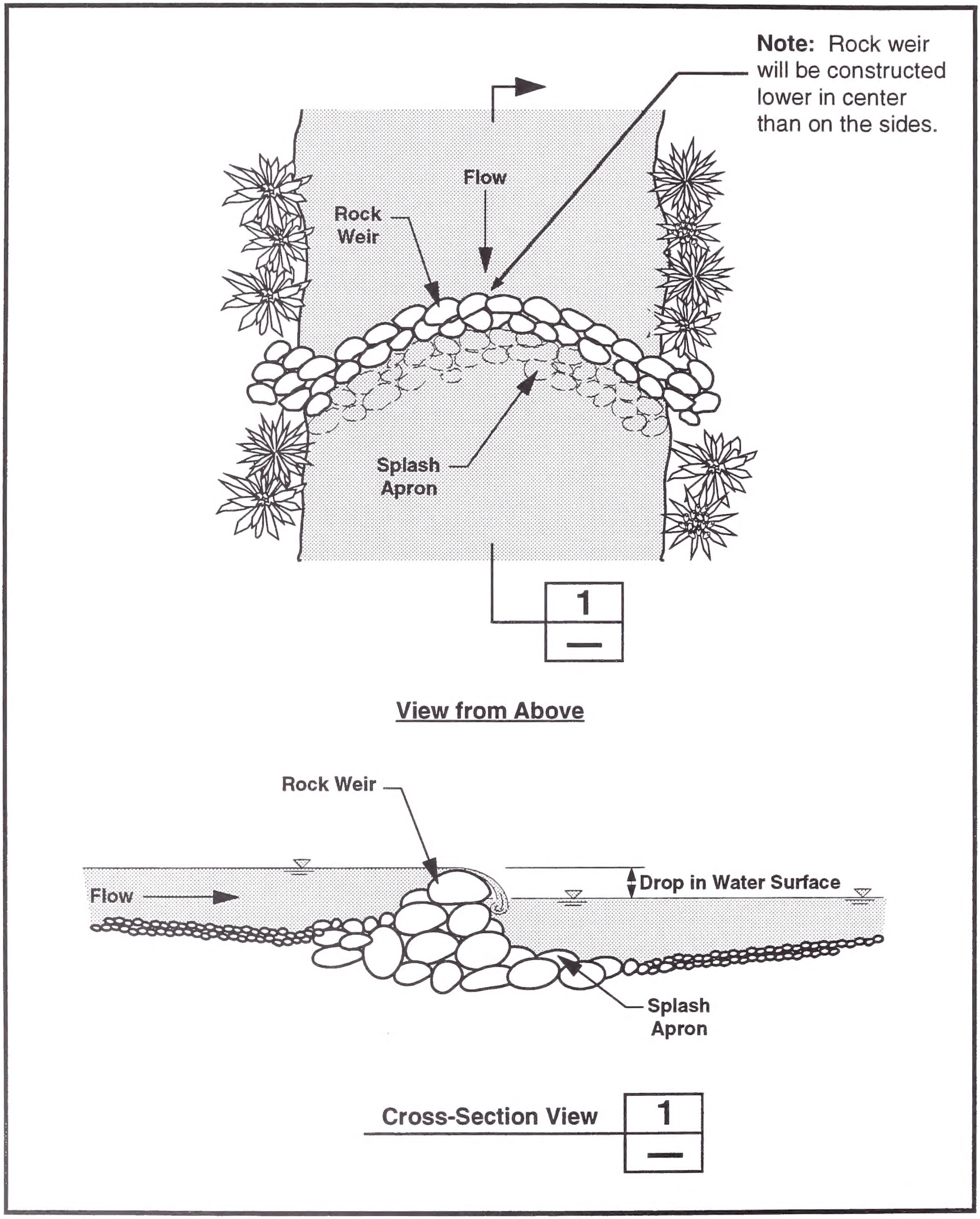


Figure 1-15
Schematic of Rock Weir

spawning habitat for trout, as well as providing a minimum level of channel erosion control. Final design would incorporate modifications from this plan as required to meet conditions in the channel when the project is implemented. Certain structures may be dropped from implementation or substituted based on experience and agency preference.

Under this alternative channel width and depth are defined by the presence of the existing dikes. Discharges up to or in some areas exceeding the 100-year peak discharge are contained within the dikes with no overbank/floodplain flows, except in Reach 4 which has no dikes. Table 1-13 shows average channel velocities and other channel and floodplain characteristics for the Instream Structures Alternative throughout a range of design flows.

The Instream Structures Alternative would not involve modifications to diversion dams or headgates. It is assumed that diversion modifications necessary to accommodate the minimum instream flow requirement would be made as part of baseline conditions.

1.7.2 Public Access

The seven public access points shown in Map 1-1 in Section 1.3.1 and an access corridor along the entire existing river channel would be developed under baseline conditions. No new public access corridor areas beyond baseline would be acquired for the Instream Structures Alternative. Fencing would be accomplished under baseline conditions.

1.7.3 Changes in Ownership and Land Use

1.7.3.1 Land Ownership

The Instream Structures Alternative could be fully constructed and maintained within the existing property and easements owned by the United States, even without the public access corridor acquisition assumed for baseline conditions. However, remaining non-federal lands on the river would be acquired in fee title, to satisfy the baseline requirements (see Section 1.4.1).

1.7.3.2 Land Use

Construction vehicles and equipment would use temporary access roads to move from existing public roads to construction areas throughout the Project Area. The majority of these roads would be situated along the existing and proposed channel alignments or along the existing dikes and would become part of the area acquired for the Core Area. Land uses of all types would be temporarily restricted on access roads during construction. Less than one acre of existing lands outside the Core Area would be needed for construction access roads. Existing and planned land uses could resume after construction on access roads not in the Core Area.

The Project Area would be fenced to exclude livestock from natural resource areas and to protect surrounding private property from the public. The type and style of minimum standard fencing would be as described under baseline conditions (see Section 1.4.1). Provisions would be made for allowing livestock crossing or access zones through the fenced areas where this would be required by the adjacent landowner to continue grazing activities.

1.7.4 Construction Procedures

1.7.4.1 Typical Construction Procedures

Construction activities would be conducted with a minimum of disturbance on the existing channel and adjacent areas. Only light mechanical equipment (e.g., backhoe, small dozer, track-mounted excavator, truck for hauling large rock) would be required for placement of habitat structures after materials have been delivered to the site.

Typical construction procedures would consist of first staking locations of proposed habitat structures, or marking locations on existing trees, boulders, etc. Some of this surveying was accomplished in 1991 as part of the Clearwater BioStudies, Inc. project, but it may have to be verified or re-surveyed. Structure locations would not be exact as shown in the design plans as long as structures could be suitably anchored in place.

Larger construction materials (boulders, logs, trees) would be stockpiled as close to the construction sites as possible. Selection of stockpiling sites would be accomplished in coordination with landowners, agencies, or the contractor to minimize impacts on existing land uses. Smaller materials may be stockpiled at the USBR facility below Jordanelle Dam for later use by construction crews.

Table 1-13
Channel and Floodplain Reach Characteristics Under the Instream Structures Alternative

						Mean Channel Velocity		
Reach	Channel Length (ft)	Bankfull Width (ft)	Floodplain Width (ft)	Channel Slope (ft/ft)	Bankfull Depth (ft)	Base Flow (ft/sec)	Bankfull Discharge (ft/sec)	100-year Discharge (ft/sec)
2	5,500	70	N/A	.005	7.1	2.1	7.0	6.5
3	7,510	80	N/A	.006	6.0	2.4	7.6	6.6
4	6,920	120	600	.008	3.0	2.9	6.5	5.0
5	4,440	100	N/A	.010	7.0	3.2	10.5	6.8
6	8,720	90	N/A	.011	7.0	2.5	11.0	7.2
7	4,730	80	N/A	.011	7.0	2.7	10.0	6.9
8	4,600	110	N/A	.009	6.1	3.0	9.9	6.5
9	8,460	80	N/A	.010	6.0	3.1	9.0	8.0

Notes:

1. A persistent and well-defined riffle/pool sequence does not exist under baseline conditions; the geomorphic and hydraulic parameters are for average conditions. Their location is most closely classified as a "run".
2. Base Flow = 125 cfs.
3. "Bankfull" corresponds to the top of the existing levees.
4. Bankfull discharges generally exceed the post-Jordanelle 100-year peak discharge.
5. N/A = Not applicable.

Boulders comprising certain rock structures may have to be cabled to one another for increased structural stability. Logs protruding into the channel would have to be cabled to trees or boulders on the bank, or pinned to the bank or channel bars. When cabling logs to live trees, shims would be used to protect the tree. Rebar up to 8 feet long would be used to pin logs in place.

Construction would not affect existing utilities. This alternative would not involve major excavation, and all utilities crossing the Provo River are suspended rather than buried.

Construction would be scheduled to occur only during low flow periods, which generally last from August through April during a normal hydrologic year. Minor temporary in-channel diversions would be constructed using river bottom material as necessary to accommodate construction activities in the channel.

1.7.4.2 Typical Noise Levels and Air Emissions

Table 1-8, Section 1.5.4.2 in this EIS, shows typical noise levels that would be associated with operation of numerous types of equipment during construction. Backhoes, dozers, and haul trucks would be used to construct the Instream Structures Alternative. Not more than two pieces of each type of equipment would be in operation concurrently during the construction period.

Table 1-9, Section 1.5.4.2 in this EIS, shows typical air emissions associated with various types of construction equipment.

1.7.4.3 Temporary Construction Access

Construction workers and equipment would use existing roads and rights-of-way to gain access to the Provo River. Requests would be made of certain landowners to access the river or private roads. Federal property and federal construction easements exist along nearly all of the PRRP river corridor. Where they exist, these federal easements would allow for construction of Instream Structures Alternative project features. Map A-2 in the map pocket at the back of the EIS shows locations of existing federal land parcels. The remainder of the Core Area required for the Instream Structures Alternative would be acquired in fee title under baseline conditions. The Core Area would serve as the construction zone for this alternative.

1.7.5 Maintenance Procedures and Management of the Project Area

The proposed fish habitat enhancement structures would be susceptible to damage or complete washout from the high velocities and erosive conditions prevalent in the existing confined channel. Cabled logs could be dislodged and washed downstream; boulders could be buried with coarse bedload; and organic bank protection could be eroded away from the high channel velocities during peak flows. The highly mobile cobble channel bed would make permanent anchoring of the structures difficult. An assessment of the effectiveness of similar fish habitat structures (Mitigation Commission 1995) indicates that about 25 percent of the structures may be expected to fail or require extensive rehabilitation within the first 5 years (FWS 1997).

Maintenance procedures would consist of annual inspections and replacement of damaged structures. Instream structures would be visually inspected each year after the peak spring runoff period. Most damage would be expected to occur during this high flow period. During inspection, a decision would be made on whether a replacement structure would be viable in the same location; a different type of structure should be tried; or a new structure should be installed in a different location. The Mitigation Commission or its assigns would be responsible for maintaining instream structures.

Maintenance of irrigation structures would continue to be the responsibility of the irrigation companies or private irrigators. It is assumed that required modifications to maintenance and repayment contracts between Provo River Water Users Association and the Bureau of Reclamation associated with Jordanelle Reservoir impacts on river hydrology and operation of the existing diversion structures would be completed as part of baseline conditions.

Management of the Instream Structures Alternative Project Area would be the same as described under baseline conditions (Section 1.4.2). See Table 1-14 for a description of estimated labor and costs of operation, maintenance and management of this alternative.

Table 1-14
Employment Opportunities and Estimated Pay Rates for Construction and Maintenance of the Proposed Action and PRRP Alternatives

Category	Compensation	Work-Months			
		Baseline	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Construction Contractor Forces					
Administrative	$55,000/yr	0	31	24	1.3
Supervisory	$45,000/yr	0	62	48	2.5
Skilled Labor	$22.96/hr	0	312	240	7.5
Unskilled Labor	$10.76/hr	0	374	288	13.0
Total Contractor Work Force*		0	779	600	24.3
Construction Management Staff					
Administrative	$50,000/yr	0	31	24	1.3
Professional	$65,000/yr	0	31	24	1.3
Technician/Inspector	$35,000/yr	0	62	48	2.5
Total Construction Management Work Force		0	124	96	5.1
Total Work-Months		**0**	**903**	**696**	**29.4**
Maintenance Staff					
District Engineer	$65,000/yr	0	0.25 yr	0.25 yr	0.25 yr
Clerical	$25,000/yr	0	0.25 yr	0.25 yr	0.25 yr
Field Supervisor	$45,000/yr	1 yr	1.875 yr	1.5 yr	2 yr
Field O&M Laborers	$30,000/yr	0.25 yr	1.125 yr	1.25 yr	2.25 yr
Annual O&M Work-Months		**1.25**	**3.5 (+2.25)#**	**3.25 (+2.0)**	**4.75 (+3.50)**

Notes:

*Does not include offsite waste material haul manpower.

#Indicates work-months increase over baseline.

1.8 No Action Alternative

Implementation of the No Action Alternative would not stabilize the Provo River's bed and banks, restore the riverine habitat or improve instream fish habitat. Figure 1-16 shows a schematic of a typical river section under the No Action alternative. Very little habitat diversity exists within the baseline channel. The needs defined in Section 1.2 would not be met and baseline conditions would continue, including annual maintenance of dikes and diversions along the Provo River. The Mitigation Commission would remain obligated to meet the project needs discussed in Section 1.2 of this EIS.

The following commitments included in the M&I System EISs related to Jordanelle Reservoir (USBR 1979 and USBR 1987) would still be implemented under baseline conditions and their related effects would continue under the No Action Alternative.

- CUWCD would maintain a minimum streamflow of 125 cfs in the Provo River between Jordanelle and Deer Creek reservoirs.
- Any existing river diversion facilities located between Jordanelle and Deer Creek reservoirs that are incapable of allowing a minimum of 125 cfs to pass at all times would be reconstructed to function properly under baseline. Any changes to river diversion facilities beyond those that would be made under baseline are described as part of the Proposed Action and alternatives.
- The Mitigation Commission would construct seven new fishing access points along the Provo River between Jordanelle and Deer Creek reservoirs, acquire and fence land along the Provo River to provide contiguous pedestrian access (by foot only), and construct parking areas and sanitary facilities
- CUWCD would deliver supplemental CUP water to water users in Heber Valley and below Deer Creek Reservoir as Jordanelle Reservoir goes into operation

The impacts of the commitments were documented in the M&I System EISs related to Jordanelle Reservoir (USBR 1979 and USBR 1987).

1.9 Summary of Other Characteristics

1.9.1 Construction Schedule and Number of Workers

Figures 1-17, 1-18, and 1-19 show monthly construction schedules and average number of workers for the Proposed Action, Existing Channel Modification and Instream Structures alternatives.

The Proposed Action would be constructed during a period of about 67 months. A maximum of 25 workers would be on-site at any time, with an average work force of 15. Construction would proceed in a downstream direction. The level of work effort would not diminish through the spring and early summer high flow period, but work would be shifted to off-channel features such as new channel meanders, side channels, ponds, setback dikes, etc.

The Existing Channel Modification Alternative would be constructed during a period of about 48 months. A maximum of 25 workers would be on-site at any time, with an average work force of 15. After an initial waiting period for acquisition, the initial construction phase would occur north of river road. Work effort in the existing channel would be lightest during the seasonal high flow period.

The Instream Structures Alternative would be constructed during a period of five months with an average of six workers on-site throughout construction. All work would be accomplished during a single low water (fall and winter) construction period.

1.9.2 Employment Opportunities

Table 1-14 shows employment opportunities and estimated pay rates for construction and maintenance of the Proposed Action and alternatives. The project would employ both skilled and unskilled workers. Similar types of workers would be required for each alternative. It is assumed that 75 percent of the contractor's labor force would be non-county residents from the Salt Lake City, Provo, and Orem areas. The remaining 25 percent would be Wasatch County residents.

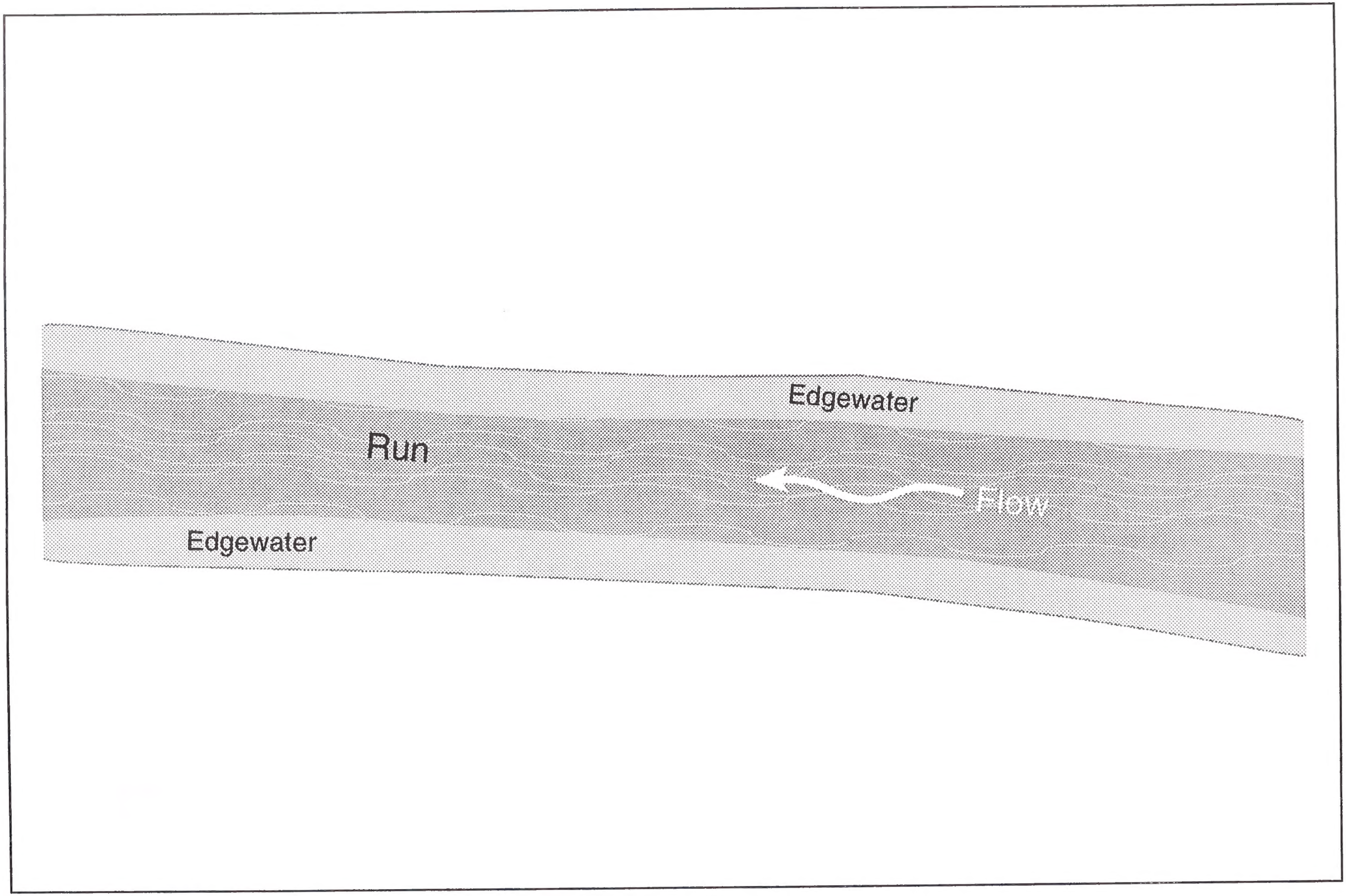


Figure 1-16
Schematic Drawing of Typical Segment of Provo River Channel
Under No Action Alternative

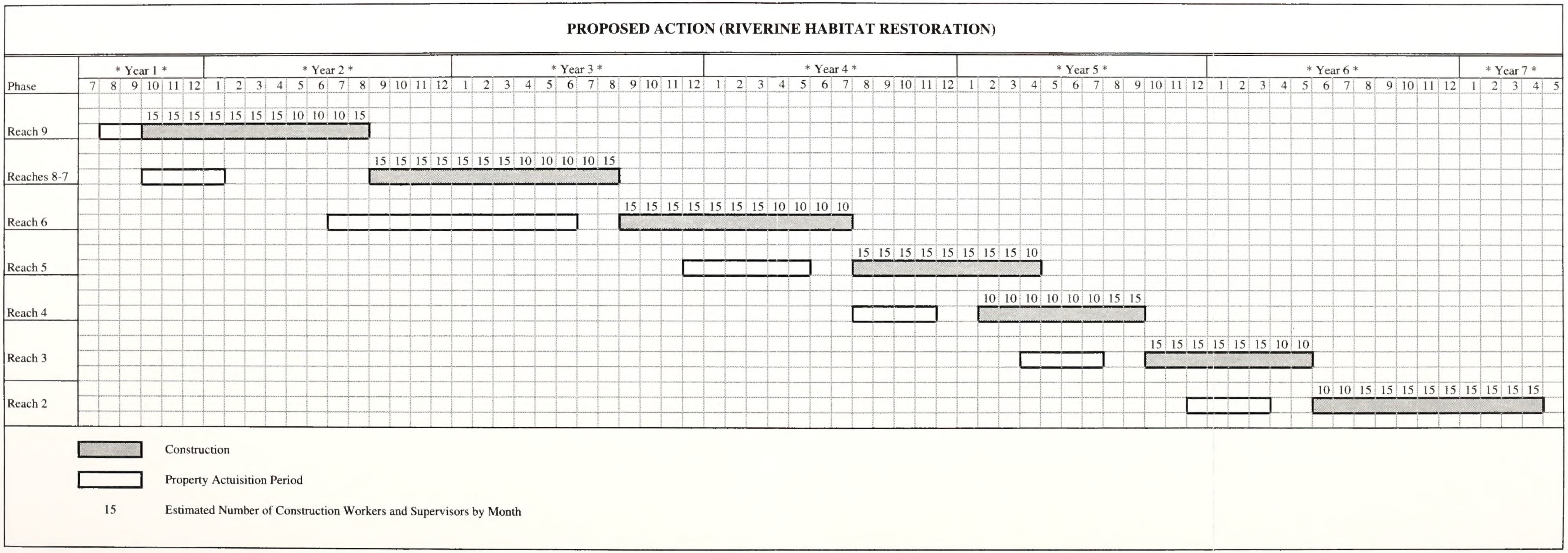


Figure 1-17
Construction Schedule and Average Number of Workers for Proposed Action

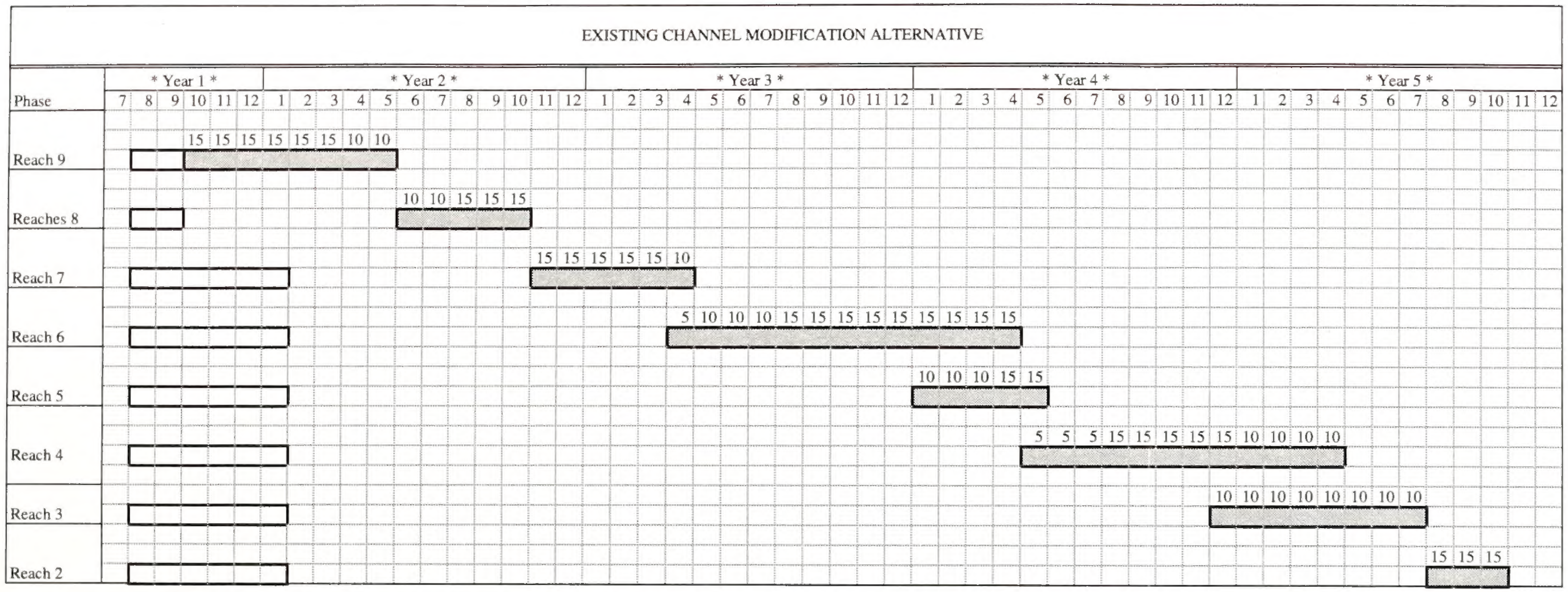


Figure 1-18
Construction Schedule and Average Number of Workers for Existing Channel Modification Alternative

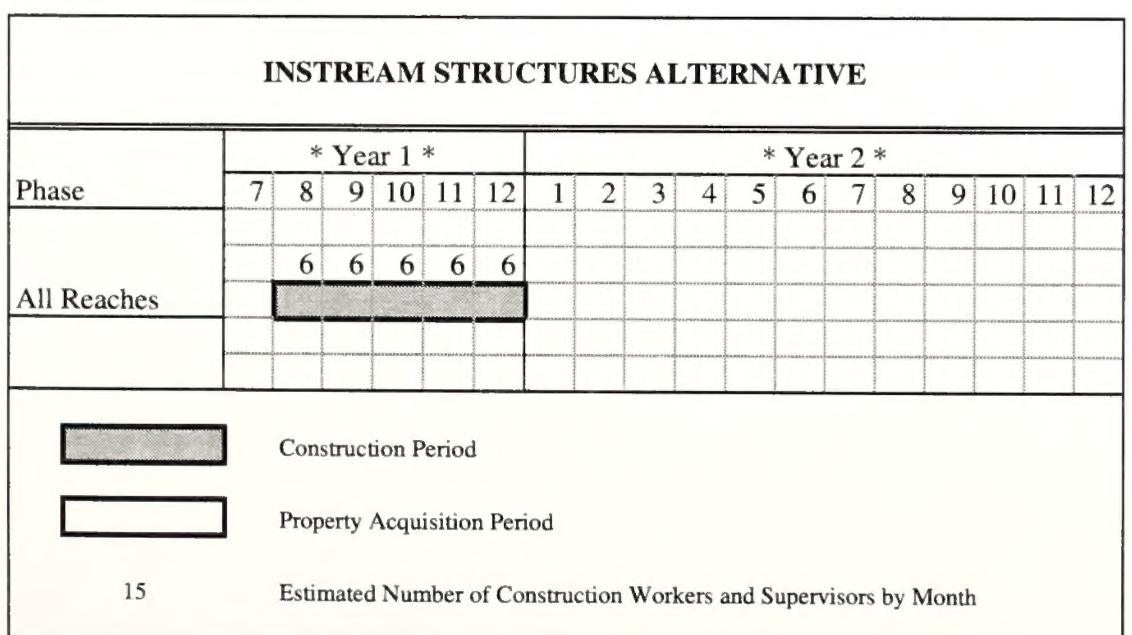


Figure 1-19
Construction Schedule and Average Number of Workers for the Instream Structures Alternative

The Mitigation Commission would be responsible for conducting or contracting for maintenance activities. See Section 1.4.2 for a discussion of how this responsibility is proposed to be managed.

1.9.3 Transportation Requirements

Table 1-15 lists construction transportation requirements for the Proposed Action and alternatives. Construction management staff and workers would use pickup trucks and other passenger vehicles to commute to the project site. The estimated number of round trips is based on an occupancy rate of one person per vehicle. Approximately 75 percent of the contractor work force and nearly all the construction management staff would commute to the site from outside of Wasatch County. Commuters traveling from Salt Lake City would use Interstate 80 and U.S. 40. Commuters from the Provo-Orem area would use State Route 189 through Provo Canyon.

Rock haul trips in Table 1-15 only include bringing rock to the site from offsite borrow areas. This only would be required under the Instream Structures Alternative. Rock needed in the other alternatives would be salvaged from the existing levee riprap.

The Proposed Action and Existing Channel Modification Alternative would generate large quantities of waste material resulting from channel excavation. Although salvageable material (e.g., boulders, river cobble, woody material, topsoil) would be sorted and stockpiled on site, large amounts of unclassified dirt, rock and vegetation debris would be hauled offsite for disposal. It is currently proposed that waste material would be hauled to the large material extraction area in Heber Valley east of State Route 189 near the community of Charleston (northeast corner of USGS Section 23). A large pit is being developed at this site into which PRRP waste material could be dumped and then sorted and processed for use as construction materials. The processed material would be distributed to the various quarry customers, and the unusable material would be disposed along with the normal waste material from the quarry operation. Other quarry sites in Heber Valley could be used in a similar fashion for their sorting, processing and distribution capabilities. It is possible that some of the processed materials (e.g., crushed gravel) could be used to help construct the Wasatch County Wetland Enhancement Project with Daniel Replacement Pipeline.

1.9.4 Materials Used During Construction

Table 1-16 lists construction material requirements for the Proposed Action and alternatives. The principal materials used for channel construction would be large rock, river cobbles, and vegetative material (e.g., transplants, root wads). The majority of these materials would be supplied from onsite sources made available through other aspects of the construction project. Material requirements exceeding salvage quantities would be filled using local quarries, seed suppliers, etc. Relatively small amounts of concrete and steel would be used in reconstructing diversions. A large amount of fencing would be installed for the Proposed Action and Existing Channel Modification Alternative, in addition to fencing required for baseline conditions. The Instream Structures Alternative would use about 116 large logs for fish habitat structures. Geotextile fabric would be used to control surface and channel bank erosion in selected areas for the Proposed Action and Existing Channel Modification Alternative.

A large amount of spoil material would be generated during construction. Disposal of this material is discussed in the previous section.

1.9.5 Projected Project Life and Costs

The Proposed Action and the Existing Channel Modification Alternative would be designed as self-sustaining natural systems once riparian bank stabilization has been established. Although channel geometry, alignment and other aspects of the riparian system may adjust over time in response to changing hydrology, watershed land use, etc., the overall integrity of the system would not deteriorate. The only elements of the project which would have standard operational lives are the diversion structures, which would have a typical life of about 100 years.

Certain features of the Instream Structures Alternative such as cabled logs could have operational lives of as short as 1 to 5 years because of potential washouts by high flows. Other more permanent structures such as rock weirs and boulder placements could have operational lives of 10 to 20 years, depending on the rate of bed sediment

Table 1-15
Construction Transportation Requirements for the Proposed Action and PRRP Alternatives

	Construction Off-Site Traffic in Round Trips							
	Construction Management Staff		Contractor Worker Vehicles		Rock Truck Haul		Waste Truck Haul	
	Total	Peak Daily	Total	Peak Daily	Total	Peak Daily	Total	Peak Daily
Proposed Action (Riverine Habitat Restoration)	2,500	4	16,500	25	0	0	4,100	7
Existing Channel Modification Alternative	2,000	4	14,000	25	0	0	4,700	10
Instream Structures Alternative	150	2	750	10	26	1	0	0

Table 1-16
Construction Material Requirements for the Proposed Action and PRRP Alternatives

Type of Material	Use of Material	Source of Material	Amount of Material		
			Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Timber	Logs for fish habitat structures	Source unknown	none	none	116
	Bridge reconstruction	Local source	2880 board-ft	none	none
Large Rock (>2 ft Dia.)	Fish habitat struct.	Local source	none	none	13,106 cu yd
	New channel riffles	On-site/Local source	13,300 cu yd	26,967 cu yd	none
	Special bank treatment	On-site/Local source	2,338 cu yd	1,360 cu yd	none
	Pool features	On-site/Local source	5,200 cu yd	5,300 cu yd	none
	Grade control struct.	On-site/Local source	2,184 cu yd	1,386 cu yd	none
	Rock drops	On-site/Local source	34,068 cu yd	37,241 cu yd	none
	Existing structure protection	On-site/Local source	1,336 cu yd	1,670 cu yd	none
		Total	**58,426 cu yd**	**73,924 cu yd**	**none**
Large River Cobbles	New channel riffles	On-site	43, 357 cu yd	75,644 cu yd	none
Pipe (8 in. diameter, concrete lined ductile iron)	Jordanelle Wetland water supply pipeline	Outside county; source unknown	400 ft		none
Concrete	Diversion structures	Local source	18 cu yd	20 cu yd	none
	Bridge relocations	Local source	489 cu yd	none	none
		Total	**507 cu yd**	**20 cu yd**	**none**
Steel	Diversion structures	Outside county; source unknown	1.6 tons	1.8 tons	none
	Bridge relocations	Outside county; source unknown	22.7 tons	none	none
		Total	**24.3 tons**	**1.8 tons**	**none**

Table 1-16
Construction Material Requirements for the Proposed Action and PRRP Alternatives

Type of Material	Use of Material	Source of Material	Amount of Material: Proposed Action (Riverine Habitat Restoration)	Amount of Material: Existing Channel Modification Alternative	Amount of Material: Instream Structures Alternative
Fence (wire net)	Fence acquired property	Source unknown	9,450 ft	4,570 ft	none
Vegetation (living and dead)	Bank stabilization (e.g., root wads, willow stakes)	On site	3.7 acres	3.1 acres	none
	Floodplain revegetation (e.g., sod mats, seeding)	On site/Local Source	96.0 acres	149.6 acres	none
		Total	**99.7 acres**	**152.7 acres**	**none**
Geotextile Fabric	Surface erosion management	Unknown	348,000 sq. yds.	543,000 sq. yds.	none
Waste Material		Spoil site: Heber Valley quarries	206,000 cu yd	237,000 cu yd	none

Notes:

1. For Proposed Action, approximately 48,000 cu. yds of rock are available from on-site salvage
2. For Existing Channel Modification Alternative, approximately 45,000 cu yd of rock are available from on-site salvage
3. Fence lengths are in addition to baseline fencing requirements (73,790 ft)

transport and deposition in the channel under post-Jordanelle Dam conditions.

Table 1-17 shows the projected capital, property acquisition and maintenance costs of the Proposed Action and PRRP alternatives. The project's capital costs consist of design, construction and contingencies. Assumed costs for property acquisition were $22,000 per acre for fee title acquisition of lands not encumbered with flood or construction-flood easements, and $9,500 per acre for fee title acquisition of lands with existing flood or construction-flood easements. Annual maintenance costs include inspections and maintenance of the project components.

1.9.6 Standard Operating Procedures

This section defines standard operating procedures (SOPs) for the PRRP. SOPs would be followed during construction and maintenance of the project to avoid or minimize adverse impacts to people and natural resources. The mitigation measures identified in Chapter 3 are designed to avoid or minimize the adverse and significant impacts of the project expected to occur after the SOPs have been successfully implemented.

1.9.6.1 Standard Operating Procedures During Construction

The following SOPs would be used during construction of the PRRP.

Agricultural

- Farm and ranch owners who may be affected by project construction would be notified of construction procedures and schedules to prevent conflicts with agricultural operations. Procedures to avoid conflicts with agricultural operations would be followed during construction to the maximum extent possible. Unavoidable damage to facilities would be replaced or restored during project construction. Farmers and/or landowners who experience additional unavoidable impacts on agricultural facilities and operations would be compensated for their direct cost of moving or reconstructing facilities. The value of agricultural production on lands acquired would be addressed during the land valuation process that would be used to determine the fair market value of the land.

Air Quality

- EPA's recommendations for aggregate storage pile emissions (AP-42, Section 11.2.3) would be followed to the extent feasible to minimize dust generated by the project. This would consist primarily of periodic watering of equipment staging areas and dirt roads used during construction.
- Construction machinery would be routinely maintained to ensure that engines remain tuned and emission-control equipment is properly functioning as required by law.

Aquatic Resources

- Heavy equipment use in stream beds and riparian areas during construction would be minimized to the extent possible. The duration of heavy equipment intrusion into the existing channel would be minimized to the extent possible.
- Impacts on aquatic resources can be avoided and minimized by following hazardous materials procedures included under the health and safety SOPs, the revegetation and erosion control SOPs, and wetlands SOPs.
- The procedures described in Section 1.5.4, 1.6.4 and 1.7.4 would be applied to minimize sediment entrainment and turbidity resulting from disturbance of the existing channel. Sediment and associated nutrient inputs during the July-September period which could increase blue-green algae blooms in Deer Creek Reservoir would be reduced or avoided by scheduling in channel work to avoid the July-September and other high flow periods to the extent possible.

Cultural Resources

- A detailed site inventory would be conducted for the selected project after the EIS process is completed and before construction is started. This would be conducted by cultural resource experts in areas that would be directly impacted by construction. Data would be recovered and mitigation procedures used when

Table 1-17
Projected Costs of the Proposed Action and PRRP Alternatives (1997 $)

	Estimated Capital Cost[1]	Estimated Land Acquisition/ Easement Cost	Estimated Annual Maintenance Cost[2]
Proposed Action (Riverine Habitat Restoration)			
Reach 1	none	none	none
Reach 2	$1,630,000	$1,664,000	$700
Reach 3	$1,760,000	$1,411,000	$900
Reach 4	$574,000	$2,280,000	$800
Reach 5	$1,898,000	$1,663,000	$600
Reach 6	$3,690,000	$1,930,000	$1,100
Reach 7	$1,451,000	$568,000	$500
Reach 8	$1,004,000	$57,000	$700
Reach 9	$2,344,000	$157,000	$1,100
Total	**$14,351,000**	**$9,730,000**	**$6,400**
Existing Channel Modification			
Reach 1	none	none	none
Reach 2	$1,313,000	$145,200	$1,000
Reach 3	$2,093,000	$41,800	$1,300
Reach 4	$1,764,000	$111,100	$1,200
Reach 5	$1,497,000	$7,700	$800
Reach 6	$2,925,000	$16,500	$1,500
Reach 7	$1,487,000	$0	$800
Reach 8	$1,254,000	$0	$800
Reach 9	$2,263,000	$0	$1,500
Total	**$14,596,000**	**$322,300**	**$8,900**
Instream Structures	**$1,014,000**	**$0**	**$20,400**

Notes:
[1]Capital costs include construction, engineering and contingencies.
[2]Maintenance costs for Instream Structures Alternative assumed to be 3 percent of instream structure construction costs (per Aquatic Habitat Improvement Plan)

adverse impacts are unavoidable. A Programmatic Agreement among the Department of the Interior, Mitigation Commission, Utah State Historic Preservation Office and The Advisory Council on Historic Preservation was executed July 18, 1997 (see Appendix F).

Energy Conservation

- Standard energy conservation measures would be used during construction, operation and maintenance, e.g., avoiding unnecessary idling, and keeping vehicles and equipment tuned and maintained.

- The shortest possible transportation routes would be used during construction to conserve fuel.

Health and Safety

- The Utah Occupational Safety and Health Act and the conditions of the federal Occupational Safety and Health Standards would be followed during construction. Copies of these publications and the health and safety SOPs would be provided to project workers at construction sites.

- Warning signs and temporary barriers would be provided in areas used by pedestrians, bicyclists or other recreationists where construction activities are underway.

- Onsite and offsite construction activities would fully conform with the standards in the USBR safety and health standards manual (USBR 1993). These standards include the following items:

  - Good housekeeping practices for routine scrap removal from work sites

  - Proper handling, storage, use and disposal of toxic materials

  - Prohibiting use of alcohol, drugs and firearms

  - Restricting public access to work areas to the extent possible

  - Providing onsite training to employees exposed to hazards associated with work assignments

  - Weekly safety meetings conducted by supervisors for employees under their supervision

  - Providing adequate first-aid supplies, trained personnel and emergency evacuation procedures

  - Dissemination of information on the hazards of chemicals used, stored or produced in workplaces to employees, contractors, visitors and the public who could potentially be exposed

  - Mandatory use of appropriate protective work clothing

  - Use of a uniform standard signal system in the operation of cranes, derricks and hoists

  - Use of dependable, trained and qualified signal and flag persons wearing high-visibility apparel for traffic control

  - Adherence to a detailed fire protection plan (e.g. fuel storage and refueling facilities)

  - Proper storage of materials used in construction

  - Operation of equipment only by employees qualified to operate the type of equipment assigned

  - Providing necessary barricades, walkways, lighting, a public awareness program, and posting for public protection before the start of excavation operations

- The 1995 pre-design Cross Drainage Study would identify the storm runoff potential of local streams and basins for 25- and 100-year flood events. This study identifies both the peak and duration of flows that could occur where project construction would be located. Appropriate modifications would be made to project design and emergency response plans to minimize flood hazards.

Noise

- The location of schools, churches, nursing homes, residential areas and other "sensitive receptors" would be considered when scheduling construction activities with significant noise levels.

- Mufflers on construction equipment would be checked regularly to minimize noise.

- Construction contractors would be required to follow the noise exposure and hearing conservation standards and practices contained in USBR's manual (USBR 1993) to protect potentially exposed project workers and the public from harmful noise levels.

Revegetation and Erosion Control

- Revegetation and erosion control SOPs would be used where project construction would disturb soil. These areas are expected to be along channel construction and modification areas, construction access roads, floodplain grading areas, setback dikes, and stockpile areas. The procedures would be designed to restore vegetation to a desired riparian plant community, and to prevent infestation by noxious plants and to avoid erosion.

- Noxious weed control is an important component of the PRRP. Construction of the project would disturb a large number of acres, providing an opportunity for noxious weed invasion. Appendix A presents a Noxious Weed Control Plan.

- If possible, Jordanelle Reservoir outflows would be managed during the 5 years following construction to promote desired riparian plants and to prevent severe erosion. This would allow riparian and floodplain vegetation to become established until it could provide erosion control. This procedure would be dependent on hydrologic conditions during and after project construction.

- Disturbed areas would be reclaimed to desired riparian, agricultural and upland plant communities as soon as possible after construction. The contractor would be required to use specified plant materials and reclamation techniques.

- Areas used for small grains or row crops would be ripped and left bare for the landowner to cultivate and plant at the same time as adjacent farmland.

- In areas subject to erosion, erosion control measures would be implemented to prevent wind and water erosion and help establish vegetation. A site analysis would be conducted to determine the appropriate type of mulch and other erosion control material for each area.

- The criteria for selecting species to plant in disturbed areas would include hardiness, compatibility with wildlife, capacity to stabilize soils, but must also be compatible with riparian restoration goals.

- To maximize the success of revegetation, planting would occur during appropriate climatic periods in properly prepared soil. Planting, watering and fertilizer application techniques would be chosen for specific conditions at each site and the needs of selected plant species. In addition, techniques would be implemented to promote natural recruitment of riparian trees and shrubs. These techniques include producing controlled floods of moderate magnitude, with the appropriate timing, duration, frequency and rate of flow change.

- Revegetation and erosion control areas would be monitored and repairs made if necessary. Revegetated areas would be monitored for invasion of noxious weeds and other weed species, as required by Section 4.17.3 of the Utah Noxious Weed Act, and appropriate weed control measures implemented. These measures would include establishing a cover of desirable plant species as quickly as possible after construction, interim seeding of topsoil stockpiles if they would remain barren for lengthy periods of time, conducting weed surveys during the fall and spring after initial seeding, applying pesticides or removing the weeds by hand before they develop seeds or spread roots, and applying pesticides in accordance with federal application and record-keeping requirements. Monitoring for revegetation success would be conducted for a period of a minimum of 3 years for undeveloped lands following completion of

initial revegetation. Appendix A provides the details of a noxious weed control program.

- Temporary fencing would be erected in areas where livestock or wildlife would likely interfere with successful revegetation and erosion control.

- Landowners would be compensated during the construction access easement acquisition if any valuable ornamental trees or shrubs need to be removed or disturbed.

Transportation

- Staging areas for construction material and equipment would be sited to minimize or avoid traffic impacts in residential, commercial, and recreation access areas.

- Traffic control and other safety measures in construction and maintenance areas would be followed to minimize the risks of accidents to vehicles and pedestrians during construction and maintenance of the project.

- Impacts in areas with significant traffic levels, such as critical intersections and primary arterial roads, would be minimized or avoided to the extent feasible by scheduling equipment transport and material deliveries during off-peak hours. Off-peak hours are those times during any given work day which have traffic volumes less than the highest Annual Average Daily Traffic.

- Roads damaged by project construction activities would be restored to at least the level that existed prior to construction.

- The shortest possible transportation routes would be used to dispose of spoil and waste.

- Construction and traffic control procedures would be designed to allow continued access to businesses and residences.

- Construction and traffic control procedures would be designed to minimize the length of detours.

- Project personnel would control traffic in affected areas.

Visual Resources

- Disturbed areas would be landscaped to match existing and characteristic land forms. When feasible, disturbed areas would be recontoured and slopes rounded along river banks to blend with surrounding natural contours.

- New plantings would be blended with natural vegetation at the edges, and would be configured to match existing vegetation patterns and provide horizontal and vertical diversity.

- Power poles and other existing facilities would be relocated as necessary to minimize visual impacts on nearby residents.

Water Quality

- The SOPs described for aquatic resources also would help protect water quality.

- The hazardous materials procedures included under the health and safety SOPs and the erosion control SOPs would help avoid and minimize adverse water quality impacts.

Wetlands

- Direct and indirect impacts on wetlands would be avoided, unless there are no other practicable alternatives ("practicable" as defined in 40 CFR 230.3 means capable of being done, after taking into consideration cost, existing technology and logistics in light of overall project purposes). Procedures to avoid impacts would include protection of wetlands with silt fencing during construction and avoiding quantity and quality impacts on surface water and groundwater resources that serve as a source of water for wetlands.

- If necessary, areas of proposed dike removal and breaching would be modified in the field during construction to protect and preserve as much riparian vegetation and wetlands along the existing river corridor as possible. Areas of heavy construction activity, equipment storage and stockpiling would be selected to minimize impacts on existing riparian vegetation and wetlands.

- Where impacts on wetlands cannot be avoided, impacts would be minimized to the extent possible and mitigation approaches would be reviewed with the U.S. Army Corps of Engineers (COE).

- Heavy equipment in wetland areas would be operated on geotextile mats with gravel overlay to minimize soil and vegetation disturbance.

- When necessary, construction barriers would be installed to prevent unnecessary construction damage to adjacent wetlands.

- Wetland topsoils requiring removal would be stockpiled, replaced, and disturbed areas would be graded to match previous contour elevations.

- Disturbed wetland areas would be revegetated with a mixture of desirable wetland plant species.

- A wetland monitoring plan would be established to evaluate the success of mitigation measures. Such mitigation measures would be modified as needed to ensure successful mitigation. Successful mitigation would be determined by the appropriate regulatory agencies (i.e., COE, NRCS, FWS, and Utah Division of Wildlife Resources).

Wildlife Resources

- To the extent feasible, the new channel alignment, setback dikes, and maintenance roads would be located and constructed to avoid or minimize the removal of large trees.

- To the extent feasible, construction activities on or around important game or non-game species habitat (e.g. deer fawning areas) would be scheduled to avoid the period of greatest use.

- Impacts on wildlife resources also can be avoided and minimized by hazardous materials procedures included under the health and safety SOPs, the revegetation and erosion control SOPs, and wetlands SOPs.

- Collection and translocation of spotted frogs will be in accordance with protocols to be developed by the Mitigation Commission and other members of the Bonneville Basin Conservation and Recovery Team and its technical advisors. The protocols will also be reviewed for approval by the Utah Division of Wildlife Resources in conformance with policies, procedures and regulations governing the "Collection, Importation, Transportation, or Possession of Zoological Animals".

- During construction in Reach 9, spotted frogs would be precluded from moving into the "wire ponds" before the ponds are impacted by construction activities. In Reach 9, spotted frogs would be prevented from moving back into the "wire ponds" or entering the construction area. Exclusion would be accomplished by placing drift fences around ponds, and between the construction area and the USBR Jordanelle wetlands areas in Reach 9. Pit-fall traps would be placed along the drift fence prior to fall season and before construction begins. Trapping would be continued in the spring. The traps would be checked at regular, frequent intervals so that captured frogs could be moved to a suitable area. Such trapping and relocation would be in accordance with protocols described in the previous SOP.

- During construction, a trained person shall be on-site to coordinate implementation of SOPs involving spotted frogs, and to identify and resolve problems involving spotted frogs. This action would be performed by personnel trained by qualified professional herpetologists. Accurate records of all activities involving spotted frogs will be maintained in accordance with approved protocols.

1.9.6.2 Standard Operating Procedures During Maintenance and Management

Air Quality

- Maintenance vehicles would be routinely maintained to ensure that engines remain tuned and emission-control equipment is properly functioning as required by law.

Energy Conservation

- Standard conservation measures would be used during project maintenance, e.g., avoiding unnecessary idling and keeping vehicles and equipment tuned and maintained.

Health and Safety

- The Utah Occupational Safety and Health Act and the conditions set forth in the federal Occupational Safety and Health Standards would be followed during maintenance. Copies of these publications and the health and safety SOPs would be provided to project workers.

- Operation and maintenance activities would conform fully with the standards contained in the USBR safety and health standards manual (USBR 1993). Examples of these standards are listed in the health and safety portion of Section 1.9.6.1.

1.10 Authorizing Actions, Permits and Licenses

This section defines the actions, permits and licenses needed to construct and maintain the PRRP. Table 1-18 defines these authorizing actions and includes information concerning the types of actions, agencies responsible for each action and the related project features.

The following outlines the overall implementation program:

- Conceptual Study (completed 1992)
- Technical Report/Feasibility Study (completed 1994)
- Environmental Impact Study (present document)
- Issue Record of Decision
- Final Design
- Apply for required permits
- Develop and Implement Management Plan
- Land Acquisition
- Construction
- Maintenance and Monitoring

Final designs for the Proposed Action or selected PRRP alternative would be prepared after the EIS is finalized, a Record of Decision has been issued, and prior to construction. Construction of the PRRP would proceed on a reach-by-reach basis following acquisition of properties needed to implement the selected alternative, if any.

1.11 Interrelated Actions

This section describes projects that could cause cumulative impacts with the PRRP Proposed Action (Riverine Habitat Restoration) and alternatives. These projects are referred to as interrelated projects.

The Council on Environmental Quality (CEQ) Regulations (CEQ 1978) provide broad guidelines on what is to be considered in a cumulative impact analysis. Section 1508.7 of the regulations define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." Cumulative impacts are impacts caused by two or more projects on the same resource. Certain past projects have caused impacts in the impact area of influence and are part of the baseline conditions against which the impacts of the PRRP Proposed Action and alternatives are measured.

The interrelated projects defined in this section have impacted or are expected to impact the same resources that would be impacted by the PRRP Proposed Action and alternatives. Interrelated projects from the past have influenced the affected environment (baseline conditions) defined for each resource topic in Chapter 3.

As noted in the paragraph above, "reasonably foreseeable" projects need to be included in the consideration of cumulative impacts. "Reasonably foreseeable" in this EIS means the future project or action is identified and described in an approved public document such as a state, county or federal agency plan. There also is some expectation that the future project or action would be funded. These potential future projects and actions are expected to occur during construction or operation of the Proposed Action or alternatives. A proposal or

Table 1-18
PRRP Authorizing Actions

Page 1 of 2

Agencies	Authorizing Action	Description and Project Feature
FEDERAL AGENCIES		
Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission)	Record of Decision for PRRP EIS	The Mitigation Commission needs to approve a Preferred Alternative and accept other commitments in the Record of Decision
U.S. Fish and Wildlife Service (FWS)	Review of EIS and Biological Assessment and issuance of a Biological Opinion to ensure Endangered Species Act is complied with and preparation of a Fish and Wildlife Coordination Act Report	FWS review and consultation is required to protect candidate, threatened and endangered species; FWS conducts formal Section 7 consultation on all listed species affected by the project and will issue a Biological Opinion after it reviews the project's Biological Assessment; it also will prepare a Fish and Wildlife Coordination Act report on the Proposed Action
U.S. Army Corps of Engineers (COE)	Issues Section 404 permits	Because construction of the project will cause placement of fill material and excavation in "waters of the U.S.," including wetlands, a Section 404 permit under the Clean Water Act would be needed from the COE
Environmental Protection Agency (EPA)	Has veto authority on Section 404 permits issued by COE; and 401 permits issued by water quality agency (see below); also reviews and rates all EISs	If the EPA feels potential wetlands, water quality or other impacts have not been sufficiently avoided or mitigated, it can suggest additional mitigation or new alternatives
U.S. Bureau of Reclamation (USBR), Mitigation Commission	Issues land-use license; responsibility for USBR flood control dikes along river	A land-use license would be required for new channel and dike construction on lands owned by USBR or on which USBR holds a construction easement; Provo River Water Users Association (PRWUA) has a contract with USBR to maintain dikes along the Provo River; the contract would be renegotiated to cover new dikes
Utah Department of Natural Resources (UDNR), Division of Water Rights, State Engineer	Approval of changes in water rights, diversions and places of water use; issues permits for modifying stream channels	Approval of the project's relocated diversions would be required; modifications to stream channels must be permitted under Utah State law (73-3-29, Utah Code Annotated)

Table 1-18
PRRP Authorizing Actions

Agencies	Authorizing Action	Description and Project Feature
STATE AGENCIES		
UDNR, Utah Division of Parks and Recreation	Approve development within the authorized floodplain, through Utah River Enhancement statues	Approval would be required of development within the 100-year floodplain or within 150 feet of the river banks; a new floodplain would be adopted under the Proposed Action
UDNR, Utah Division of Wildlife Resources	Concur with the FWS Fish and Wildlife Coordination Act report	
Utah Department of Environmental Quality (UDEQ), Division of Water Quality	Issues Section 401 water quality certifications	A Section 401 water quality certification under the Clean Water Act would be issued once this agency determined the project's water quality impacts were sufficiently mitigated; required for Section 404 permits
Utah Department of Transportation (UDOT)	Issues approval to work in highway right-of-ways	Approval would be required to work in the right-of-way of State Highway 40
COUNTY AGENCIES		
Wasatch County Transportation Department	Issues permits for work in county road right-of-ways	Approval would be required to conduct channel construction activities in the right-of-ways for county roads crossing the channel alignment
Wasatch County Commissioners	Approve zoning changes	Zoning changes would be required to regulate future building in designated floodplain areas under the Proposed Action
IRRIGATION COMPANIES		
Heber Valley Irrigation Companies	Agreements as needed	Agreements between local irrigation companies and the Mitigation Commission may be needed to specify the procedures used to modify diversions and canals

project must be described in sufficient detail to allow a determination of its potential impacts. Further, the determination of cumulative impacts is based on net impacts, or those impacts remaining after mitigation has been applied.

The first step in determining the future interrelated projects to consider in the PRRP cumulative impact analysis was to develop a list of potential projects and actions. To accomplish this task the following entities were contacted: the Natural Resources Conservation Service (NRCS), Utah Department of Transportation (UDOT), Wasatch County Planning Department and Wasatch County Special Service Area (WCSSA). The identified projects and actions were then compared against the criteria described in the paragraph above to determine if they should be included in the cumulative impact analysis.

Section 1.11.1 describes past and future interrelated projects that were addressed in the cumulative impacts analysis, while Section 1.11.2 defines potential projects that were not addressed in the cumulative impact analysis. The results of the cumulative impact analysis are presented in Section 3.21 of this EIS.

1.11.1 Projects Addressed by the Cumulative Impact Analysis

1.11.1.1 Past Interrelated Projects

1.11.1.1.1 Agricultural and Urban Development in Heber Valley. Most of Heber Valley has been developed for agricultural purposes and has recently experienced a housing construction boom. Heber Valley was settled by farmers during the 1860s and their diversions from the Provo River and other streams were used to irrigate pasture land and grow such crops as alfalfa and small grains. Today, approximately 12,800 acres in Heber Valley are irrigated for agricultural purposes, and additional lands in the Valley and surrounding uplands are used for grazing. While agricultural lands benefit some wildlife, most native species have been adversely impacted by the conversion of riparian woodlands and other habitat types to agricultural and urban land uses.

The amount of land developed for urban land uses (especially residential uses) has increased dramatically in Heber Valley in recent years. Since 1985 through May 1996, about 47 subdivision projects have been constructed in Heber Valley (Wasatch County Planning Department 1996). Most of this construction has occurred during the 1990s. Approximately 830 single-family and 250 multi-family lots have been constructed in Midway, Charleston, Daniels, Heber City and the Lake Creek/Center Creek area east of Heber City. These projects have been built on about 1,000 acres, not including the Midway subdivisions. According to data from the Bureau of Economic and Business Research at the University of Utah, 249 permits for new single-family dwelling units were issued in 1994, compared to an average of 60 per year from 1980 to 1989 and an average of 128 per year from 1990 to 1994 (Bureau of Economic and Business Research, 1990, 1993, and 1995).

Agricultural and urban development in Heber Valley has impacted some of the same resources that would be affected by the PRRP Proposed Action and alternatives. The primary EIS resource topics related to these cumulative impacts are water resources, wetlands, aquatic resources, water quality, threatened and endangered species, agriculture, socioeconomics and wildlife resources.

1.11.1.1.2 Modifications to the Provo River in Heber Valley. Past modifications to the Provo River in Heber Valley have had a significant impact on the Valley's water resources, aquatic resources, wetlands and wildlife habitat. Historical photographs of the Provo River in Heber Valley show a broad area of dense riparian vegetation 1,000 feet wide or more. The Provo River also was more sinuous as is typical of naturally functioning rivers. Over the past 100 years or so, the following types of modifications have been made to the River:

- Construction of levees along most of the River in Heber Valley through the Provo River Channel Revision Project which controlled flooding and channel migration
- Construction of hard sills or dams at points of irrigation diversions
- Diversion of Provo River flows to provide agricultural water supplies
- Construction of transbasin diversions to the Provo River watershed from the Weber, Duchesne and Strawberry River basins

- Clearing and filling of abandoned floodplain areas to support agricultural and municipal land uses along the Provo River

- Construction and filling of Jordanelle Dam and Deer Creek Reservoir

These modifications and other important human-induced changes to the Provo River corridor in Heber Valley are summarized in the PRRP Technical Report (CUWCD 1994). Heber Valley was an important spawning area for native cutthroat trout from Utah Lake. However, the native cutthroat populations in Heber Valley were largely eliminated by dewatering of the Provo River by irrigation and power diversions that started in the 1930s and completion of Deer Creek Reservoir in 1941. However, the stocking of non-native trout allowed the river's fishery in Heber Valley to still be one of the best in the state until the 1950s when the Provo River Channel Revision Project was undertaken by USBR as a flood control project greatly altered the Provo River channel. These projects, including construction of dikes and filling of abandoned floodplain areas, were designed to provide a safe and larger channel capacity that could handle high spring runoff flows from the Provo River basin plus additional flows of up to 1,000 cfs from the Duchesne and Weber river transbasin diversions. River channel modifications have occurred nearly every year since the 1950s as the Provo River Water Users Association rework river bed sediment (mostly cobble rock) in the channel at diversions and along dikes. Construction of Jordanelle Dam began in 1990 and the filling of Jordanelle Reservoir began in 1993.

The primary EIS resource topics related to the impacts of past Provo River modifications are water resources, wetlands, aquatic resources, water quality, threatened and endangered species, agriculture, socioeconomics and wildlife resources.

1.11.1.2 Future Interrelated Projects

This section summarizes future projects that are reasonably foreseeable and could cause cumulative impacts under the PRRP Proposed Action and alternatives. The following subsections summarize the schedules of these projects and identify the primary EIS resource topics that are related to the projects.

1.11.1.2.1 Urban Development in Heber Valley. The recent trend of increasing urban development in Heber Valley is expected to continue. The driving forces of growth in Heber Valley — population and employment growth along the Wasatch Front and in Summit County — are not expected to subside in the foreseeable future. Heber Valley would continue to be an attractive "bedroom community" for people who need to be within commuting distance of some of Utah's major employment centers while living in a rural and scenic area.

As of May 1996, about 28 residential subdivisions have been or are expected to be approved for construction in Heber Valley, excluding the town of Midway. These projects would be constructed on approximately 2,100 acres and would have about 1,530 single-family lots and 321 multi-family units. These housing developments would mostly be in the vicinity of Midway, Charleston, Daniels, Heber City and the Lake Creek/Center Creek area east of Heber City. County planning officials foresee as many as 5,800 new single-family dwelling units built in Wasatch County in the next 20 years, an average of 290 per year (Noffsinger 1995). An additional 13 developments with about 2,787 single-family lots, 2,799 multi-family units and 1,300 hotel/motel rooms have been proposed near Jordanelle Reservoir. Heber Valley's permanent population and traffic would increase significantly after these projects are completed. For example, Heber City's population is expected to increase from about 5,000 people today to 8,000 by the year 2015 (Heber City 1996). The Wasatch County Planning Department expects the County's population to increase from about 12,200 to 28,400, or 133 percent, over the next 20 years (Wasatch County Planning Department 1996).

Future urban development in Heber Valley would impact some of the same resources that would be affected by the Proposed Action and PRRP alternatives. The primary EIS resource topics related to these future cumulative impacts are water resources, wetlands, aquatic resources, water quality, threatened and endangered species, agriculture, socioeconomics and wildlife resources.

1.11.1.2.2 The Wasatch County Water Efficiency Project With Daniel Replacement Pipeline. The Wasatch County Water Efficiency Project (WCWEP) With Daniel Replacement Pipeline would help improve water use efficiency in

nine of 12 Heber Valley irrigation companies, where pressurized water would allow farmers to convert from flood irrigation to sprinklers. New pipelines would be extended from the Timpanogos, Wasatch and Humbug canals to deliver pressurized water to irrigation company service areas. Some distribution canals would be replaced by pipelines, resulting in water conservation through improvement in conveyance efficiency. Non-Central Utah Project water conserved under the WCWEP With Daniel Replacement Pipeline would be used to supplement the flows of five Heber Valley streams: Rock Ditch, Spring Creek, lower Lake Creek, London Ditch and Creamery Ditch. The WCWEP With Daniel Replacement Pipeline would include energy and pumping facilities (funded by Heber City) that would allow Heber City to pressurize water for lawn and garden irrigation under a local development known as the Heber City Secondary System. The Daniel Replacement Pipeline would provide Daniel Irrigation Company (DIC) with replacement water after their diversions from the upper Strawberry River basin are terminated. Replacement water would be conveyed through the Timpanogos Canal and new pumping stations and pipelines. Diversions from the upper Strawberry River basin would stop once the Proposed Action is implemented. The DIC diversion facilities would be abandoned and removed or retained for historic interpretation in non-functioning condition, and natural stream flows in the upper Strawberry River basin and its tributaries would be restored after the transbasin diversion to Daniels Creek is terminated.

The PRRP and WCWEP With Daniel Replacement Pipeline also would cause cumulative impacts on certain resources after they are constructed. The PRRP would improve some environmental resources and recreation opportunities along the river. Adjacent farm land, wetlands, local residents and land owners would be impacted by the PRRP. A peak work force of approximately 77 workers would construct the WCWEP With Daniel Replacement Pipeline. Records of Decision selecting the WCWEP with Daniel Replacement Pipeline were signed by the Mitigation Commission on March 12, 1997 and by the U.S. Department of the Interior on March 21, 1997. The primary EIS resource topics related to this project would be wetlands, aquatic resources, wildlife resources, threatened and endangered species, socioeconomics, agriculture and recreation.

1.11.1.2.3 The Tri-Valley Watershed Plan. The NRCS is developing a watershed plan for Heber Valley, Round Valley and the southern portion of Kamas Valley. New water quality management techniques and sprinkler irrigation conversions would be cost-shared by the NRCS and implemented on a voluntary basis by eligible local farmers and ranchers. The plan was completed in the late summer of 1997. An Environmental Assessment on the plan was completed in September of 1997. A Finding of No Significant Impact was issued by the NRCS on September 30, 1997. The sprinkler irrigation conversions are expected to occur concurrently with construction of the WCWEP With Daniel Replacement Pipeline and with Public Law 566 funding. The water quality management elements of the plan would focus on education and demonstration projects during the first two years of implementation. Based on experience with similar projects, NRCS expects participation in the water quality elements to increase after the effects of the demonstration project are observed by local people.

The water quality elements of the plan would be designed to control erosion and pollutants from dairies, feedlots, and surface return flows. Practices may include fencing, filter strips, land-use changes from pasture to cropland, streambank stabilization, improved animal-waste management and utilization, constructed wetlands and a prescribed grazing system. During the long-term, the plan is expected to improve water quality in Heber Valley streams and Deer Creek reservoir by reducing sedimentation and phosphorous and nitrogen runoff from pastures, croplands and confined feeding operations. The primary EIS resource topics related to this project would be water quality, aquatic resources, agriculture and socioeconomics.

1.11.1.2.4 Highway 40 Upgrade North of Heber City. UDOT plans to widen State Highway 40 in Heber Valley from the River Road intersection to the northern boundary of Heber City, doubling capacity from two to four lanes when completed in 1998. UDOT projects a peak of 66 construction workers. Impacts would include physical disturbance of wetlands and other resources in the highway right-of-way, socioeconomic impacts from construction workers and air quality, noise and traffic impacts. The affected EIS resource topics would be wetlands, aquatic resources, socioeconomics, air quality, noise and transportation.

1.11.1.2.5 Expansion of the Regional Wastewater Treatment Plant in Heber Valley. The Heber Valley Special Service District and the Utah Division of Water Quality are planning to expand the capacity of the existing regional wastewater treatment plant in Heber Valley. The expansion, expected to occur in the next five to seven years, is needed to handle the significant increase in wastewater to be generated by new development in Heber Valley, around Jordanelle Reservoir and in the hills east of Heber Valley. Adding capacity at the plant is expected to resolve existing water quality problems at the plant and in the surrounding area. The primary EIS resource topics related to this project would be water quality, aquatic resources and socioeconomics.

1.11.1.2.6 UDOT Highway 189 Projects. UDOT plans to eventually upgrade Highway 189 from Provo to Heber City. The following upgrades would increase the capacity of Highway 189:

- Murdock to Upper Falls upgrade (completed)
- Upper Falls to Wildwood upgrade (to be constructed from spring 1996 to fall 1998)
- Deer Creek Dam buttressing project (to be constructed in 1997 or 1998)
- Upgrade from the Highway 92 junction to Deer Creek Dam (schedule not determined)
- Upgrade from Deer Creek Dam to Charleston (schedule not determined)
- Upgrade from Charleston to Heber City (schedule not determined)

While not yet funded, the last three upgrades are expected to be funded. Many construction workers and vehicles would be required to complete the upgrades. For example, 200 workers would be needed for the upgrade from Upper Falls to Wildwood, and 250 would be needed for the Deer Creek Dam buttressing project. The UDOT projects would primarily cause transportation, air quality, noise and socioeconomic impacts during construction along Highway 189 — where some construction and recreation traffic would travel under the PRRP Proposed Action and alternatives. The primary EIS resource topics that are related to these projects are transportation, wildlife, air quality, noise, wetlands, and socioeconomics.

1.11.2 Projects Not Addressed by the Cumulative Impact Analysis

A Provo River Recreation Study and Conceptual Plan (Bear West 1993) was prepared for the U.S. Bureau of Reclamation (USBR) and the Utah Division of Parks and Recreation (UDP&R). This study defines alternatives for a parkway along the Provo River between Jordanelle and Deer Creek reservoirs — a concept first raised as a recreation enhancement in the Bonneville Unit Municipal and Industrial (M&I) System EIS (USBR 1979). The parkway would be a recreation corridor with land-use restrictions intended to promote a quality recreation experience and to preserve environmental resources. However, the Mitigation Commission has determined the primary objectives of the PRRP are to provide a habitat corridor, with only compatible recreation access. The cumulative impact analysis assumed the parkway plan, as a multiple use trail allowing bicycle and equestrian use, would not be implemented. The Utah Division of Parks and Recreation supports this decision (UDP&R 1997). Additionally, a conceptual report has been prepared on the Wasatch Back Trail. Pursuant to the Recreation Trails Act of 1991, the Utah Division of Parks and Recreation proposes to establish a recreational trail called the Wasatch Back Trail from Echo near the intersection of I-84 and I-80 to Vivian Park in Provo Canyon. One segment of the trail would pass through the PRRP project area. The current conceptual plan has this segment being constructed on existing roads. This project is still in its initial conceptual phase, has not received the necessary funding or permits and is considered too speculative for further analysis in this EIS.

Other potential projects in the vicinity of the PRRP Proposed Action and alternatives include proposed ski resorts on the northern and western edges of Heber Valley. These have not received the necessary funding or permits and are considered too speculative for further analysis in this EIS.

Provo River
Restoration Project

CHAPTER 2

Comparative Analysis of Impacts of the Proposed Action and Alternatives

Final Environmental Impact Statement

Chapter 2
Comparative Analysis of Impacts of the Proposed Action and Alternatives

2.1 Introduction

This chapter presents in summary fashion the impacts of the Proposed Action (Riverine Habitat Restoration), and the Existing Channel Modification, Instream Structures, and No Action Alternatives. Detailed impact analysis is located in Chapter 3 and the seven final technical reports listed at the beginning of Chapter 3. The impacts shown in this chapter are the impacts that would occur to baseline conditions. Information on baseline conditions is presented in Chapter 3, Section 3.1.2.

2.2 The No Action Alternative

The No Action Alternative would result in a continuation of baseline conditions. The No Action Alternative would result in the following impacts.

- The need to restore the Provo River to a more naturally-functioning, riverine ecosystem would not be met. The measures authorized by the Central Utah Project Completion Act (CUPCA) to rehabilitate riparian habitat and restore fish habitat in this reach of the Provo River would not be implemented. The Mitigation Commission would remain obligated to develop and implement other measures not yet identified to meet the environmental mitigation and conservation commitments.
- The need to comply with legal requirements (beyond the baseline commitments described in Section 1.4.1) defined in the documents cited in Section 1.2 of Chapter 1 would not be met. The required environmental improvements, which are for partial mitigation of impacts caused by the Central Utah Project (CUP) and other USBR projects in Utah, would still have to be implemented by the Mitigation Commission.
- The beneficial and adverse impacts summarized in Section 2.3 would not occur

The following commitments included in the M&I System EISs related to Jordanelle Reservoir (USBR 1979 and USBR 1987) would still be implemented under baseline conditions and their related effects would continue under the No Action Alternative.

- CUWCD would maintain a minimum streamflow of 125 cfs in the Provo River between Jordanelle and Deer Creek reservoirs.
- Any existing river diversion facilities located between Jordanelle and Deer Creek reservoirs that are incapable of allowing a minimum of 125 cfs to pass at all times would be reconstructed to function properly under baseline. Any changes to river diversion facilities beyond those that would be made under baseline are described as part of the Proposed Action and alternatives.
- The Mitigation Commission would construct seven new fishing access points along the Provo River between Jordanelle and Deer Creek reservoirs, acquire and fence land along the Provo River to provide contiguous fishing access (by foot only), and construct parking areas and sanitary facilities. (See Chapter 1, Section 1.4.1). Impacts to agricultural operations would occur by altering or eliminating access to, along and across the Provo River channel by livestock, farm machinery, and other motorized equipment.
- CUWCD would deliver supplemental CUP water to water users in Heber Valley and below Deer Creek Reservoir as Jordanelle Reservoir goes into operation.

The impacts of the commitments listed above were documented in the M&I System EISs related to Jordanelle Reservoir (USBR 1979 and USBR 1987).

2.3 Comparison of Impacts

Table 2-1 documents the quantified impacts of the Proposed Action and each alternative (with the exception of the No Action Alternative). Sections 2.3.1 through 2.3.17 discuss the impacts in Table 2-1 and those that were not quantifiable.

Table 2-1
Summary of Impacts of Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative

Resource Topics	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Water Resources • Change in Heber Valley Groundwater Levels (feet)	+1 to +3 along Provo River in northern portion of Heber Valley -1 along Provo River in south-central portion of Heber Valley	0	0
Water Quality • Change in Temperature During Summer Until New Vegetation is Established (degrees Fahrenheit)	from +1.2 in Reach 5 (+2%) to +6.2 in Reach 8 (+11%)	from 0 in Reach 4 to +5.4 in Reach 8 (+10%)	0
Wetlands • Net Change in Wetland Acres	+207.6	+78.8	+0
Aquatic Resources • Change in Pounds of Trout in Provo River	+25,212 (+481%)	+7,904 (+151%)	+3,076 (+59%)
Wildlife Resources • Net Change in Acres Wetland Wildlife Habitat	+207.6	+78.8	+0
• Average Number of Birds Gained	+2,640 (+94%)	+1,328 (+47%)	0
Air Quality • Max. Vehicle Emissions During Any 12-Month Period of Construction (tons)	Nitrogen oxides: 80 Sulfur oxides: 17 Particulates: 5	Nitrogen oxides: 78 Sulfur oxides: 7 Particulates: 6	Nitrogen oxides: 23 Sulfur oxides: 2 Particulates: 2

Table 2-1
Summary of Impacts of Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative

Resource Topics	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Agriculture			
• Annual Production Loss (AUM* of grazing/pasture)	-1,916	-52	0
Socioeconomics			
• Change in Gross Agricultural Revenue (total $)	-$13,419	-$364	0
• Change in Total Gross Revenue in Wasatch County During Construction (peak annual $)	+$2,435,566 (1.92%)	+$1,671,936 (1.32%)	+$109,887 (<1%)
• Change in Total Income in Wasatch County During Construction (peak annual $)	+$1,500,243 (1.2%)	+$1,438,980 (+1.2%)	+$99,410 (+<1%)
• Change in Total Gross Revenue in Wasatch County After Construction ($ per/yr)	+$914,722 (+<1%)	+$399,420 (+<1%)	+$377,691 (+<1%)
Recreation			
• Change in Recreation Use Along Provo River (angler days/yr)	+96,020 (+481%)	+30,102 (+151%)	+11,715 (+59%)

Table 2-1
Comparison of Impacts of Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative

Page 3 of 3

Resource Topics	Proposed Action (Riverine Habitat Restoration)	Existing Channel Modification Alternative	Instream Structures Alternative
Transportation			
• Peak Increase in Traffic During Construction (daily trips)	39 on Hwy. 189 (+1%) 78 on Hwy. 40 (+1%) 78 on River Road (+6%) 78 on Hwy. 113 (+2%)	42 on Hwy. 189 (+1%) 78 on Hwy. 40 (+1%) 78 on River Road (+6%) 78 on Hwy. 113 (+2%)	12 on Hwy. 189 (<1%) 26 on Hwy. 40 (<1%) 26 on River Road (+2%) 26 on Hwy. 113 (+1%)

Note:

Impacts in this table are defined by comparing conditions with the Proposed Action and alternatives to baseline conditions (the same way impacts are defined in Chapter 3). Percent change is the change from baseline conditions.

TSS = Total Suspended Solids; NO_3 - Nitrates; and TP - Total Phosphorus

*AUM is Animal Unit Month, the amount of forage (800 pounds dry matter) required to feed one cow and calf for one month.

2.3.1 Water Resources

The Proposed Action would cause minor impacts on groundwater levels along the Provo River in Heber Valley. The Existing Channel Modification and Instream Structures alternatives would not cause any impacts on groundwater levels.

2.3.2 Water Quality

The Proposed Action and Existing Channel Modification Alternative would cause minor increases in Provo River water temperatures until new vegetation is established. The acquisition and fencing of land in addition to the area included in baseline under the Proposed Action would decrease Total Phosphorus (TP) and Total Suspended Solids (TSS) loads in the Provo River and Deer Creek Reservoir after construction. The Existing Channel Modification and Instream Structures alternatives would not decrease TP and TSS loads. Construction of the Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would cause temporary and minor increases in TSS and TP concentrations in the Provo River and Deer Creek Reservoir.

2.3.3 Wetlands

The Proposed Action would have short-term adverse impacts on 28.2 acres of wetlands during construction. Construction of the Proposed Action would permanently remove 80.0 acres of wetlands. Implementation and management of the Proposed Action would result in the creation of approximately 287.6 acres of wetlands over a period of 3 to 30 years. The Existing Channel Modification Alternative would have short-term adverse impacts on 116.8 acres of wetlands during construction. Construction of the Existing Channel Modification Alternative would permanently remove 63.1 acres of wetlands. Implementation and management of the Existing Channel Modification Alternative would result in the creation of approximately 141.9 acres of wetlands over a period of 3 to 30 years. The Proposed Action would impact 25.9 acres of USBR wetlands while the Existing Channel Modification Alternative would not impact these areas. The Instream Structures Alternative would cause only insignificant disturbances to riparian vegetation during construction and not cause any other impacts on wetlands.

2.3.4 Aquatic Resources

The Proposed Action and alternatives (with the exception of the No Action Alternative) would enhance aquatic resources habitat and trout populations over baseline conditions (see Table 2–1). The side channels associated with the Proposed Action would benefit both game and non–game species, including the leatherside chub (a State of Utah species of special concern).

2.3.5 Wildlife Resources

The Proposed Action and Existing Channel Modification Alternative would cause net increases in wildlife habitat equal to the increase in wetlands described in Section 2.3.3 and defined in Table 2-1. Many cottonwood trees would be removed during construction of the Proposed Action and Existing Channel Modification Alternative, but not during construction of the Instream Structures Alternative. New cottonwoods would be planted, which would take about 15 to 30 years to reach a height and size comparable to those removed. As shown on Table 2-1, the Proposed Action would have a positive impact on bird life, causing a major increase in abundance and diversity. The Existing Channel Modification Alternative would also have a positive impact on bird life, while the Instream Structures Alternative would not have any impact.

2.3.6 Threatened and Endangered Species

The Proposed Action and Existing Channel Modification Alternative have potential to cause impacts on threatened and endangered (T&E) species habitat, but Standard Operating Procedures (SOPs) described in Section 1.9.6.1 and other conservation measures are proposed to avoid and minimize impacts on T&E species during construction. All temporary impacts including the direct loss or degradation of potential but unoccupied habitats for Ute ladies'-tresses, bald eagle, peregrine falcon, and spotted frog caused by construction would be fully mitigated. Under the Proposed Action, potential habitats for T&E species would increase over the long-term. The Existing Channel Modification Alternative would permanently remove spotted frog habitat. The taking of spotted frogs could occur during construction of the Proposed Action and Existing Channel Modification Alternative, but SOPs are designed to avoid and minimize this potential

impact. The increase in trout populations caused by the Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would benefit bald eagles.

2.3.7 Soil Resources

The Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would cause minor increases in soil erosion during and immediately after construction.

2.3.8 Mineral and Energy Resources

The Proposed Action and alternatives (except No Action) would affect Heber Valley mineral resource sites by depositing earth material in gravel pits. They would also require the use of energy during their construction.

2.3.9 Air Quality

The Proposed Action and alternatives (except No Action) would cause an increase in vehicle emissions over baseline during the construction period. However, none of the actions would result in a violation of applicable air quality standards. The Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would cause slight increases in vehicle emissions after construction as recreation traffic increases.

2.3.10 Agriculture

The Proposed Action and Existing Channel Modification Alternative would both cause permanent impacts on agricultural land along the Provo River and a loss in annual production. The Instream Structures Alternative would not cause any impacts on agricultural production.

2.3.11 Socioeconomics

Construction of the Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would increase gross revenue, income and employment in the construction and retail trade sectors of the local economy. The total increase in revenue would be considerably larger than the decrease in agricultural revenue. After construction, the Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would increase revenue and income for businesses that serve recreationists.

2.3.12 Health and Safety

The Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would cause a minor increase in potential health and safety hazards for construction workers and other drivers because of a slight increase in the risk of traffic accidents. The risk of traffic accidents also would increase after construction as recreation-related traffic increases.

2.3.13 Noise

The Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would cause adverse noise impacts during construction and from recreation traffic after construction. Some noise impacts during construction would be significant for people who walk, drive or reside within 50 feet of construction.

2.3.14 Visual Resources

The Proposed Action and Existing Channel Modification alternative would impact visual resources during construction as a large number of mature trees and other riparian vegetation is removed. However, they would improve the visual character of the Provo River corridor in the long-term. The Instream Structures Alternative would not impact visual resources except during construction.

2.3.15 Recreation Resources

The increase in trout populations and other improvements to the Provo River ecosystem would increase recreation use in the corridor over the long-term. The increase in recreation use would be in proportion to the increases in trout populations (see Table 2-1).

2.3.16 Cultural Resources

The Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would not impact any known cultural resource sites, but have the potential to do so. The extent and location of potential impacts would not

be known until complete inventories are conducted before construction.

2.3.17 Transportation

The Proposed Action, Existing Channel Modification Alternative and Instream Structures Alternative would increase traffic on local roads during construction (see Table 2-1).

Provo River Restoration Project

CHAPTER 3

Affected Environment and Environmental Consequences

Final Environmental Impact Statement

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

The purposes of this chapter are to describe the resources (baseline conditions) that would be impacted by the Proposed Action and alternatives, and to document those direct, indirect and cumulative impacts on those resources.

This chapter is organized by resource topic. Each resource topic lists the issues addressed in the impact analysis, describes the specific impact area of influence, identifies baseline conditions, establishes significance criteria and documents impacts under the Proposed Action (Riverine Habitat Restoration), Existing Channel Modification Alternative, Instream Structures Alternative and the No Action Alternative. The assumptions and methodology used to analyze impacts for each resource topic are presented in Appendix B, Section B.2. The last four sections of this chapter describe measures that would be used to mitigate significant impacts, unavoidable adverse impacts, net cumulative impacts and irreversible and irretrievable commitment of resources for resource topics.

The impact analysis focuses on issues raised in the public scoping process and on documenting environmental impacts at a level of detail matching the intensity, duration and magnitude of impact. Significant impacts on resources are discussed in detail, and resource impacts that are not significant are summarized. The impact analysis incorporates the Standard Operating Procedures (SOPs), described in Section 1.9.6.1 of Chapter 1, which would be implemented during construction and operation to protect environmental resources.

The impact analysis describes impacts which would occur from construction, implementation, and management of the Proposed Action and each alternative. The project area for the Proposed Action is comprised of the Core Area and Expanded Restoration Area (see Chapter 1, Section 1.3 for a description of these two areas). The impact analysis for the Proposed Action assumes that all of the land included in the Expanded Restoration Area would be acquired from willing sellers and associated features constructed. It was not feasible or practical to attempt to analyze the impact of the Expanded Restoration Area separate from the Core Area. Therefore, the analysis documents the maximum level of impacts that may occur from implementing the Proposed Action. The analysis of impacts for the alternatives also present the maximum level of impacts.

The impact analysis presented in this chapter is supported by seven technical reports prepared for specific resources, which provide detailed technical information on baseline conditions, analysis methods used to determine impacts, and results of the impact analysis. These reports were issued as draft reports to support the Draft PRRP EIS. All the reports have been now issued as final technical reports. Some of the reports contain revised data and analysis as a result of comments received on the Draft EIS. The following final technical reports are summarized in the resource sections of this chapter:

- Water Resources
- Water Quality
- Wetlands
- Aquatic Resources
- Wildlife Resources
- Threatened and Endangered Species
- Cultural Resources

These technical reports are not intended as "stand-alone" documents; they rely on information about the Proposed Action and alternatives that is described in Chapter 1 of the PRRP EIS.

The technical reports are joint technical reports that support both the WCWEP and DRP Final EIS and the PRRP Final EIS. The final technical reports for the WCWEP and DRP FEIS have been reissued by the Mitigation Commission along with the PRRP final technical reports. The technical reports are available from the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) upon request at the following address:

Chad Gourley, Project Coordinator
Utah Reclamation Mitigation & Conservation Commission
102 West 500 South, Suite 315
Salt Lake City, Utah 84101

3.1.1 General Information

This section provides general information about the overall impact area of influence and environmental resources eliminated from detailed documentation of impacts.

3.1.1.1 Direct Impact Area of Influence

The direct impact area of influence is shown on Map 3-1. It covers nine reaches of the Provo River between Jordanelle Dam and Deer Creek Reservoir. These reaches represent distinctly different river segments into which the Provo River was divided for planning and environmental analysis purposes. The direct impact area of influence ranges from about 200 to 2,200 feet wide along the nine reaches. This is where most of the impacts on environmental resources would occur under the Proposed Action and alternatives. Additional indirect impacts would occur over a broader area, such as socioeconomic impacts in the rest of Wasatch County. Descriptions of impacts under the Proposed Action and alternatives make frequent reference to the river reaches shown on Map 3-1.

3.1.1.2 Environmental Resources Eliminated

The impact analysis conducted for this Environmental Impact Statement (EIS) considered all resources of the human environment subject to requirements specified in statutes, regulations or executive orders. Resources not present or not affected by the Proposed Action or alternatives may be eliminated from detailed documentation of impacts. The following environmental impact topics have been determined to be not present or not affected by the Proposed Action or alternatives:

- Prime or Unique Farmlands

  Heber Valley has farmlands that are used for hay production, miscellaneous grain crops and livestock grazing. However, based on an analysis of Natural Resources Conservation Service (NRCS) data, it was determined that prime or unique farmlands are not present in the area that would be affected by the Proposed Action or alternatives. Prime farmlands are those with soils that have the quality, length of growing seasons and moisture supply needed to economically produce sustainable high crop yields (SCS 1984). Lands affected by the Proposed Action and alternatives do not qualify because of a combination of factors, including length of growing season, soil temperature, depth to shallow groundwater and soil profile characteristics.

- Native American Religious Concerns

  Native American groups or tribes have not raised religious concerns about the lands within the impact area of influence, and the Proposed Action and alternatives would have no known impacts on Native American religious sites, ceremonies and ceremonial sites, burial grounds or other sacred lands.

- Hazardous Wastes

  The Proposed Action and alternatives would not introduce or disturb any known hazardous wastes on lands within the impact area of influence.

- Wild and Scenic Rivers

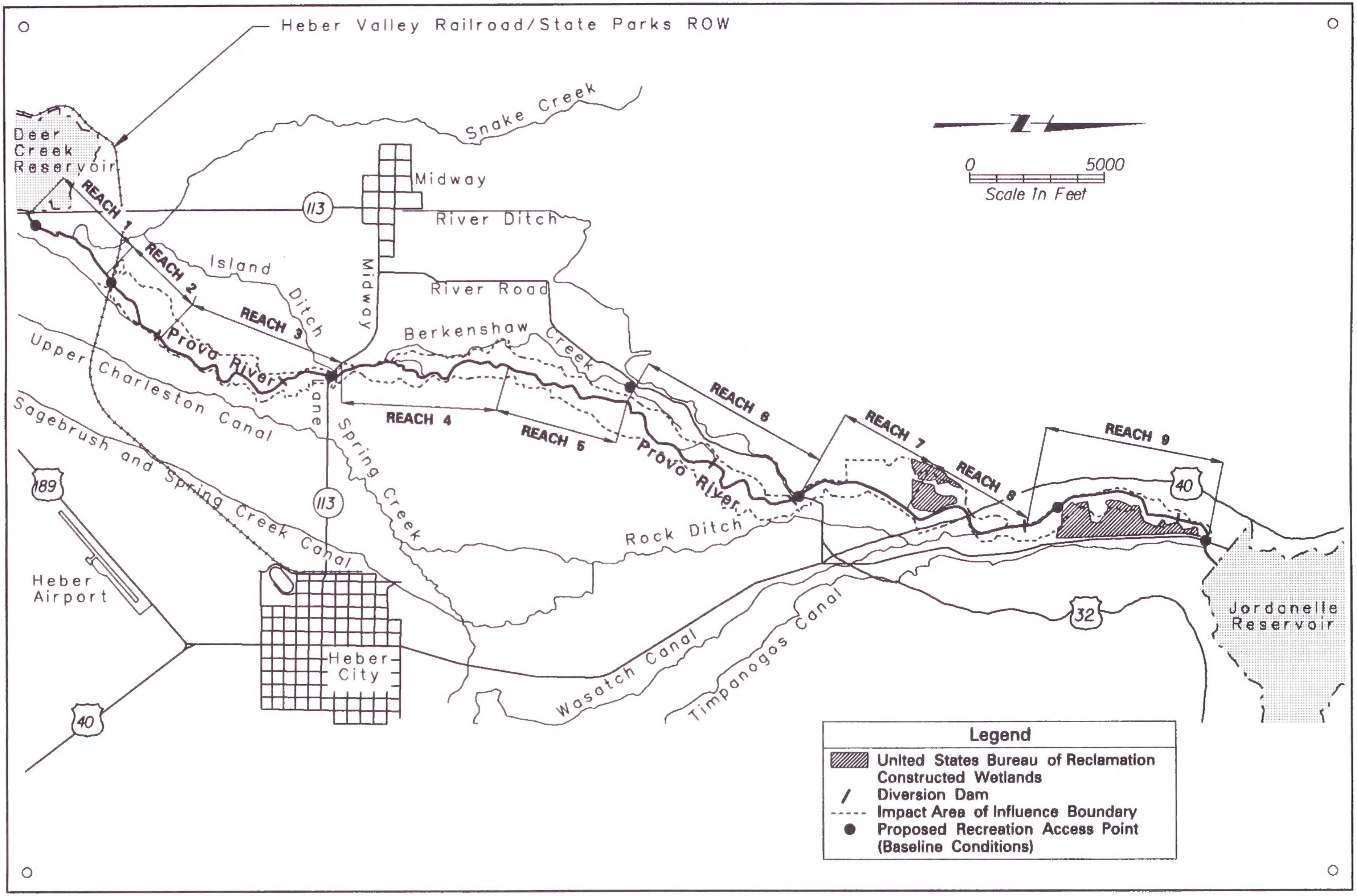
  The Provo River and its tributaries between Jordanelle Dam and Utah Lake are not protected under the Wild and Scenic Rivers Act of 1968, as amended, and there is no known proposal to protect this reach of the Provo River under the act.

- Wilderness

  The impact area of influence does not cover any lands that are protected now or proposed for protection under the Wilderness Act of 1964.

- Land Use Plans and Policies

  The Wasatch County and Heber City comprehensive plans and zoning ordinances do not have designated utility corridors or restrictions on where new facilities can be developed. Both entities rely upon the review of individual projects by their staff and Boards of Adjustment to ensure that proposed projects do not adversely affect property values, residential areas and amenities. The Proposed Action and alternatives would not



Map 3–1
Direct Impact Area of Influence

lead to conflicts with known or proposed plans or policies of federal, state or local agencies.

Vegetation was considered an impact topic during the analysis of impacts for this EIS. Several other resources contain vegetation as a component: wetlands, wildlife resources, threatened and endangered species, agriculture, and visual resources. Because these resources collectively include all aspects of the vegetation resource that could be impacted by the Proposed Action and alternatives, vegetation was dismissed as a separate EIS impact topic.

3.1.2 Existing Conditions Versus Baseline

This section provides a broad overview of the baseline environmental conditions analyzed in this FEIS, and points out the differences between the baseline and the existing conditions in the impact area of influence. The baseline, also referred to as the affected environment, is the set of environmental conditions expected to occur regardless if the Proposed Action or its alternatives are implemented. It is important to establish the baseline to understand the potential impacts of the Proposed Action and each alternative.

The baseline for the PRRP is not the same as existing conditions. Existing conditions are constantly changing because of factors beyond the control of this project. However, this document considers those changes that are expected to occur by the year 2000 as part of the baseline if they are federal commitments or requirements. These commitments include requirements of the Final Supplement to the Final Environmental Statement for the M&I System (USBR 1987) for providing seven new recreation access points (including parking areas and sanitary facilities); providing public fishing access (pedestrian only) through land acquisition along the entire Provo River corridor between Jordanelle Dam and the inlet to Deer Creek Reservoir; fencing of the public access corridor; and maintaining a minimum instream flow of 125 cfs in the same reach of the Provo River. Modifications to some existing diversions in the Provo River will be required to pass the 125 cfs minimum instream flow. The width of the public access corridor would basically be the area between the outside edge of the existing dikes, or an area extending about 50 feet beyond the existing channel banks in undiked sections of the river. These commitments will be implemented regardless of a decision to implement the PRRP described in this EIS.

To date, a portion of the angler access corridor has been acquired. The 125 cfs minimum instream flow baseline commitment has been achieved as of July 9, 1996 when Jordanelle Dam filled and became operational. The impacts of the previous commitments defined above, which become part of the baseline for this FEIS, were documented in the previously referenced EIS (USBR 1987). Therefore, those impacts are not included in the analysis of the Proposed Action or its alternatives. Refer to Chapter 1, Section 1.4.1 for a more detailed explanation of the baseline commitments and how they will be implemented.

Table 3-1 provides an overview of existing and baseline conditions. These data are provided to help the reader understand the differences between existing and baseline conditions and are based on the direct impact area of influence described in Section 3.1.1.1. There were no predicted or identifiable changes between existing and projected baseline conditions for the following resources: wetlands, wildlife, threatened and endangered species, soils, mineral and energy, air quality, health and safety, noise, visual resources, cultural and paleontological resources. Each resource topic section in this chapter provides a brief description of the baseline conditions that were used in determining impacts of the Proposed Action and each alternative.

3.2 Water Resources

3.2.1 Introduction

This analysis addresses potential impacts on water resources from the construction and maintenance of the Proposed Action and alternatives. The information and analysis documented in this section was summarized from the Water Resources Technical Report (Mitigation Commission 1997b), which is available from the Mitigation Commission upon request. This section focuses on the potential surface and subsurface hydrologic impacts of the PRRP. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.1.

Table 3-1
Existing and Baseline Conditions for Major Environmental Resources

Resource Topic and Sub-Topic	Existing Condition	Projected Baseline Condition
Water Resources		
Minimum Provo River flow below Timpanogos Diversion (cfs)	23	125
Minimum Provo River flow below Midway Diversion (cfs)	0	125
Water Quality		
Late summer average water temperature in Reach 2 (°F)	55.70	55.70
Total phosphorus (TP) average concentration discharged from Provo River to Deer Creek Reservoir (mg/L)	0.07	0.04
Total suspended solids (TSS) average concentration discharged from Provo River to Deer Creek Reservoir (mg/L)	33.10	10.90
Nitrate (NO_3) average concentration discharged from Provo River to Deer Creek Reservoir (mg/L)	0.48	0.17
Aquatic Resources		
Weighted average predicted trout standing crop (lb/acre)	28.50	57.20
Total trout biomass (pounds)	2,554.00	5,246.00
Agriculture Resources		
Grazing land (acres)	34	34
Cropland (irrigated pasture) (acres)[1]	376	361
Total animal unit months (AUM) produced	2,503.00	2,404.00
Socioeconomic Resources[2]		
Earnings	$122,018,928	$122,054,117
Employment	7,846	7,849
Total Wasatch County Revenue	$126,535,157	$126,676,393
Recreation Resources		
Angler days	916	19,980
Transportation Resources		
Highway 40 annual average daily traffic (AADT)	9,498	10,550

Notes:

[1] To achieve baseline conditions, a total of 180.7 acres of private land would be acquired, which includes the 14.9 acre difference in cropland.

[2] The socioeconomic data is based on Wasatch County.

The following surface water topics are addressed in the impact analysis:

- Changes in the availability of water supplies to water users
- Changes in streamflow
- Changes in reservoir storage, surface area and water surface elevation

The following groundwater topics are addressed in the impact analysis:

- Changes in recharge and discharge to the Heber Valley groundwater basin
- Changes in groundwater basin water levels and storage volumes

The Proposed Action and alternatives would not change the long-term pattern or frequency of flow releases from Jordanelle Reservoir. If there is a possibility of reservoir spillage, peak flows may be reduced by pre-releasing water from Jordanelle Reservoir storage during high inflow periods before workers begin modifying the river channel. All water supply and minimum instream flow requirements would be met. The potential of the Proposed Action and alternatives to change the risk of flooding resulting from physical alteration of the river channel is addressed in Section 3.13 Health and Safety.

3.2.2 Issues Eliminated From Further Analysis

The following water resource issues identified through the public scoping process were eliminated from further analysis:

- How would diversion rights (capacity and quantity) from the Provo River be impacted by channel alterations?

  All water supply facilities removed or modified by the PRRP to change river channel geometry, alignment or grade would be reconstructed to provide diversion capability at least equal to the facilities that are removed or modified. In cases where the channel elevation is lowered, new diversion facilities would be constructed upstream and connected to existing canals at a proper grade to provide the same diversion capability that presently exists. These measures would result in no changes in diversion timing or quantity from the Provo River. Maintenance of irrigation diversions would continue to be the responsibility of the irrigation companies or private irrigators, subject to the terms and of agreements negotiated to implement the PRRP (see Table 1-18 in Section 1.10 of Chapter 1).

- What opportunities would the PRRP provide for diverting Provo River flows into Berkenshaw Creek to supplement instream flows?

  Only the Proposed Action includes restoration of areas outside the existing channel easements, where Berkenshaw Creek is located, and enhancement of or creation of side channels along the river corridor. During development of the Proposed Action, it was determined that the greatest aquatic benefits would be realized with a single new side channel along the east side of the Provo River in the vicinity of Berkenshaw Creek and by maintaining existing Berkenshaw Creek conditions. Therefore, the Proposed Action as defined in Chapter 1 does not include any physical or hydrologic changes to Berkenshaw Creek. However, as stated in Section 1.5.2.2, side channels will be located during final design to integrate landscape features, and in some locations will be contingent upon willingness of landowners to sell property and to cooperate with placement of these features under the Proposed Action.

- How would irrigation water be provided to farms divided by the new channel alignments of the Proposed Action?

  The Proposed Action includes acquisition of additional land for the Provo River corridor beyond the amount acquired under baseline conditions. Farms straddling the present river channel that would be severed by the acquisition and realignment of the river corridor presently have separate water diversion and conveyance facilities on each side of the river. These facilities would remain or be relocated and reconstructed to a level that assures the same water reliability as baseline conditions. Therefore, the additional land acquisition and realigned river channel would not impact water availability to the

severed parcels, but would impact the size of the remaining parcels (see Section 3.11 for related potential impacts on agricultural operations). Payment to construct livestock watering facilities outside the acquired corridor would be included in the rights-of-way acquisition process where warranted.

- What impact would the PRRP have on peak deliveries from Jordanelle Reservoir?

  The PRRP would not affect delivery of CUP Project water nor of other water rights. The PRRP alternatives are designed to function within the baseline hydrology analyzed by the 1987 Final Supplement to the Final Environmental Statement for the Municipal and Industrial System (USBR 1987). Flow adjustments which may be requested to accommodate riparian revegetation processes would be coordinated with all involved parties under the terms of the Deer Creek-Jordanelle Operating Agreement (U.S. Department of the Interior 1994).

3.2.3 Issues Addressed in the Impact Analysis

3.2.3.1 Surface Water Issues

The following surface water issues were raised during scoping and are addressed in the impact analysis:

- What impacts would the PRRP have on reducing peak flow rates from Jordanelle Reservoir during the summer months?

3.2.3.2 Groundwater Issues

The following groundwater issues were raised during scoping and are addressed in the impact analysis:

- How would the PRRP affect wells and flows from springs?
- What impacts would occur to groundwater levels?

3.2.4 Description of Impact Area of Influence

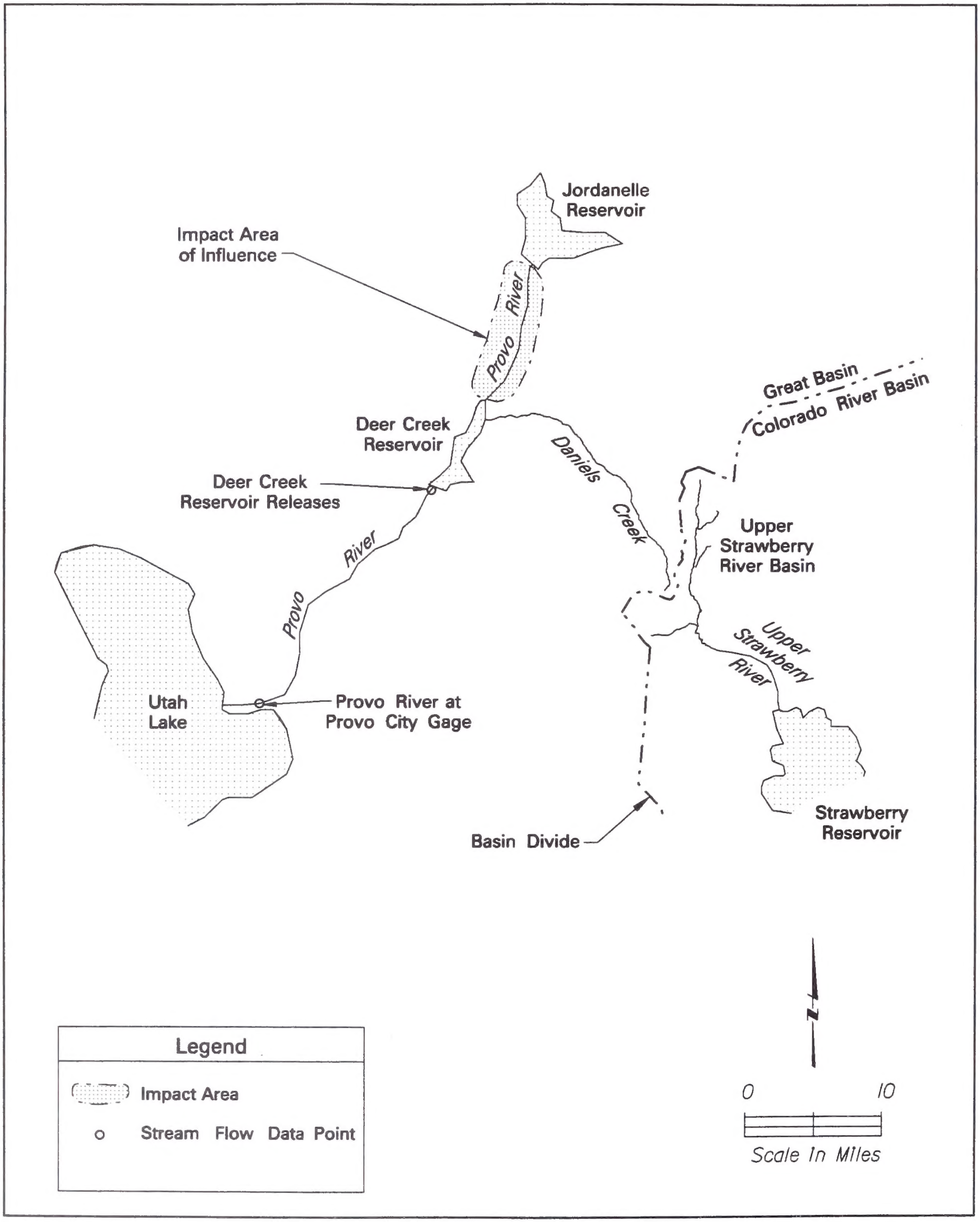
The Water Resources impact area of influence is the same as that described in Section 3.1.1.1.

3.2.5 Affected Environment (Baseline Conditions)

3.2.5.1 Provo River

Provo River flows under baseline conditions, with Jordanelle Reservoir in full operation, were modeled by the PROSIM model (see Appendix B, Section B.2.1.2.1 for a description of the PROSIM model). Each of the modeled Provo River data points used in this EIS analysis are described in the following subsections and shown on Map 3-2. Baseline modeled flows at each of the data points described in the following subsections are shown on Table 3-2. Minimum flows between Jordanelle and Deer Creek reservoirs, which would occur from late fall to late winter, would be 125 cfs. Any existing river diversion facilities located between Jordanelle and Deer Creek reservoirs that are incapable of allowing a minimum of 125 cfs to pass at all times would be reconstructed to function properly under baseline. Any changes to river diversion facilities beyond those that would be made under baseline are described as part of the Proposed Action and alternatives.

Section 303(c)(3) and (4) of CUPCA requires the minimum flow in the reach of the lower Provo River from Deer Creek Reservoir to the Olmstead Diversion to eventually be 100 cfs. Section 302(a) of CUPCA also authorizes the Mitigation Commission and the CUWCD to acquire water rights for establishing minimum flows below the Olmstead Diversion to Utah Lake of 75 cfs. After the water rights to provide this minimum streamflow have been acquired, Section 303 (c) of the CUPCA states that the 75 cfs flow "shall be provided continuously and in perpetuity from the date first feasible, as determined by the Mitigation Commission in consultation with the United States Fish and Wildlife Service and the Utah State Division of Wildlife Resources." Pursuant to CUPCA, "The District shall acquire . . . by purchase from willing sellers or exchange, twenty-five thousand acre-feet of water rights in the Utah Lake drainage basin . . . Water purchase which would have the effect of



Map 3–2
Regional Surface Water Resources That Would be Affected by the Proposed Action and Alternatives

Table 3-2
Baseline Modeled Provo River Flows
Average Monthly Flows in cfs

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
At Jordanelle Reservoir Outlet	128	126	128	192	727	967	628	503	345	129	143	131	**346**
Below Timpanogos Canal	129	127	129	191	677	908	574	473	333	129	143	132	**327**
Below Valeo Diversion	133	132	136	182	536	763	429	350	263	131	148	136	**278**
Below River Ditch	133	132	136	180	502	728	407	334	249	131	148	136	**268**
Below Island Ditch	143	144	148	192	517	746	426	349	265	146	160	146	**282**
At Inlet of Deer Creek Reservoir	224	226	230	267	592	823	491	430	365	259	257	232	**366**
At Deer Creek Reservoir Outlet	198	198	208	293	700	927	715	680	558	290	184	181	**428**
At Provo City Gage	51	60	86	152	377	429	11	1	1	21	78	66	**111**

compromising groundwater resources or dewatering agricultural lands in the Upper Provo River areas should be avoided."

Baseline conditions in this EIS were defined by assuming the 75 cfs minimum flow requirement is not in effect. It is too speculative at this time to identify necessary and related assumptions needed to define hydrology conditions (in the impact area of influence) once the 75 cfs requirement is implemented. Based on the direction of the CUPCA, CUWCD would make every effort to obtain all water rights for the 75 cfs instream flow from areas within the Utah Lake drainage without compromising water resources in the Upper Provo River areas. Purchase of these water rights would, therefore, not affect water rights in Heber Valley, where the PRRP is proposed, and would not affect the comparison of impacts of the alternatives in the Heber area. The lower Provo River reaches are therefore considered outside the project area of influence of this EIS.

The 75 cfs instream flow in the lower reach of the Provo River was not modeled by PROSIM for baseline, the Proposed Action or the DRP alternatives. In order to model the instream flow, the results of all future water purchases and exchanges would need to be known to determine how much each diversion would be reduced from the river below Deer Creek Reservoir. Modeled flows at the Provo City gage under baseline conditions are similar to existing flow conditions and were zero during some summer months.

3.2.5.1.1 Provo River at Jordanelle Reservoir Outlet. Jordanelle Reservoir outlet flows represent the total outflow from Jordanelle Reservoir, including controlled releases and spills (see Map 3-2). Average annual baseline releases would be 346 cfs.

3.2.5.1.2 Provo River Below Timpanogos Diversion. Provo River flows below the Timpanogos Diversion represent the flow in the river about 1,500 feet below Jordanelle Dam, below the Timpanogos Diversion, and after the junction of the new and old river channels (see Map 3-2).

3.2.5.1.3 Provo River Below Valeo Diversion. Provo River flows below the Valeo Diversion represent the flow in the river below the diversions to the Timpanogos and Wasatch canals and several small private diversions (see Map 3-2). They include the return flow to the river from the Wasatch bypass channel below the Wasatch Diversion.

3.2.5.1.4 Provo River Below Midway Diversion. Provo River flows below the Midway Diversion represent the flow in the river below the diversion by the River Ditch Canal operated by Midway Irrigation Company (see Map 3-2). Although this location is normally dry through the summer under present conditions, the minimum flow would be 125 cfs under baseline conditions. This location would normally be the point of lowest flow in the river because most major diversions from the river are above this location, and most return flows from Heber Valley return to the river downstream of this location.

3.2.5.1.5 Provo River Below Island Ditch Diversion. Provo River flows below the Island Ditch Diversion represent the flows in the river immediately above the point of inflow from Spring Creek (see Map 3-2). Groundwater return flows above this location are usually equal to or greater than the diversions by the Island Ditch Irrigation Company.

3.2.5.1.6 Provo River Inflow to Deer Creek Reservoir. Provo River inflow at the inlet to Deer Creek Reservoir includes the inflow to the river from Spring Creek and Snake Creek (see Map 3-2). It also includes all of the remaining return flow from the groundwater basin that returns directly to the river. It does not include all of the inflow to Deer Creek Reservoir.

3.2.5.1.7 Deer Creek Reservoir Releases. Deer Creek Reservoir releases represent the total outflow from Deer Creek Reservoir, including diversions through the Salt Lake Aqueduct (see Map 3-2). Baseline average annual flow at this location is 428 cfs.

3.2.5.1.8 Provo River at Provo City Gage. Provo River at the Provo City gage represents the inflow to Utah Lake after all diversions from the river and inflow gains (see Map 3-2).

3.2.5.2 Groundwater Resources

Approximately 1.5 million acre-feet of water is stored in the Heber Valley groundwater basin (Utah Division of Water Resources 1991). The amount

does not vary greatly over the 40-year period of hydrologic records. Very little of the groundwater in this basin is used directly for agricultural or M&I water uses. However, the groundwater discharged from the basin (which includes groundwater return flow to surface water) is an important source of water for Deer Creek Reservoir and water users downstream of the reservoir. The basin serves an important water supply function by helping regulate surface water stream flows and irrigation water that is applied in Heber Valley. Water that enters the basin as groundwater recharge takes from a few months to several years to leave the basin as groundwater discharge, depending on where the irrigation water is applied. This delay allows some water that would otherwise not be available to water users below Deer Creek Reservoir to be available because it enters the basin during spring and early summer and returns to the river at Deer Creek Reservoir during late summer and fall. The benefits of Heber Valley diversions and the basin's regulation of surface flows is recognized by the senior water right holders downstream of Deer Creek Reservoir in Utah County. The Morse Decree (Morse Decree 1921) improves the water supply of downstream water users by using Heber Valley groundwater storage to delay the return flows to downstream water users. The Morse Decree identifies Provo Division and Wasatch Division rights on the Provo River. Water distribution is performed according to a class or priority date, depending on whether the right under which water is diverted is a decreed right or established after the decree.

3.2.5.2.1 Groundwater Recharge and Discharge. Total average annual groundwater recharge and discharge closely match each other, but seasonal and monthly recharge and discharge are not similar. Sixty percent of the annual groundwater recharge occurs during the irrigation season in May, June and July. Groundwater discharge follows a different pattern, with peak discharge during July, August and September.

Table 3-3 shows the average groundwater balance in the impact area of influence under baseline conditions as modeled by MODFLOW (see Appendix B, Section B.2.1.2.1 for a description of the MODFLOW model). The term "balance" is used because the difference in monthly groundwater recharge and discharge determines the change in groundwater storage. As shown in Table 3-3, total average recharge is 91,587 acre-feet per year, while the total average discharge is 91,748 acre-feet per year. The annual change in groundwater storage over the 40-year study period under baseline conditions averages 161 acre-feet. Therefore, there is essentially no change on an average basis, and all the water that is recharged is discharged.

During wet years, groundwater storage increases by 5,780 acre-feet under baseline conditions. In the wet years, more water is recharged and about the same amount of water is discharged, which creates an increase in groundwater storage. The opposite occurs during a dry year. Groundwater storage decreases by about 12,600 acre-feet during a dry hydrologic year. The decrease in storage is the result of a decrease in groundwater recharge during a dry year. A lower water table during a dry year, in turn, results in a flatter slope to the river and a decrease in the flow rate of the groundwater to the river. These dry- and wet-year fluctuations tend to "even out" over the long-term, as demonstrated by the average change in storage value summarized above.

3.2.5.2.2 Groundwater Levels. A fully operational Jordanelle Reservoir under baseline conditions would allow CUP water to be distributed in Heber Valley, which is not available under existing conditions. Availability of CUP water is expected to increase existing springtime groundwater levels in the valley by as much as 18 feet in some areas. The greatest increases would occur in areas along the Timpanogos Canal that have the longest travel time of return flow to the Provo River. The increased water levels were modeled by the groundwater model using the distribution pattern of CUP water assumed for the Wasatch County Water Efficiency Project with Daniel Replacement Pipeline EIS (see Appendix B, Section B.2.1). These increased water levels are part of the baseline for this EIS in determining the impacts of the Proposed Action and alternatives.

Figure 3-1 is a generalized hydrogeological profile of the groundwater basin for the area south of Heber City along an east-west line running through the intersection of highways 40 and 189. Baseline groundwater elevations in Heber Valley range from 5,400 to 6,000 feet above mean sea level. Groundwater gradients range from 100 feet per mile to 40 feet per mile. Baseline groundwater levels generally follow the land surface topography. Water levels range from depths of zero to 200 feet below surface. The groundwater flows mainly in a south and west direction toward Deer Creek

Table 3-3
Modeled Groundwater Recharge and Discharge Summary
Under Baseline Average Conditions*
(all values in acre-feet)

Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Groundwater Basin Recharge													
Unconsumed Ag Water and Precip.	2,734	2,209	1,904	3,017	19,949	18,602	14,662	11,180	8,930	1,755	2,353	2,454	89,749
Supplemental Instream Losses	0	0	0	0	0	0	0	0	0	0	0	0	0
Daniels Creek Channel Losses	129	99	161	543	0	273	0	0	0	307	179	147	1,838
Total Groundwater Recharge	2,863	2,308	2,065	3,560	19,949	18,875	14,662	11,180	8,930	2,062	2,532	2,601	91,587
Groundwater Basin Discharge													
Local Drains and Seeps	1,840	1,753	1,664	1,674	2,554	2,885	2,907	2,783	2,725	2,184	2,027	1,919	26,915
Evapotranspiration	0	0	0	0	909	1,817	2,388	2,054	885	0	0	0	8,053
Snake Creek Accretions	575	559	543	529	651	725	715	688	714	624	603	586	7,512
Provo River Accretions	1,902	1,841	1,780	1,759	2,192	2,337	2,472	2,437	2,421	2,199	2,048	1,963	25,351
Deer Creek Reservoir Accretions	1,456	1,317	1,165	1,252	1,711	1,993	2,847	3,118	3,187	2,415	1,840	1,616	23,917
Total Groundwater Discharge	5,773	5,470	5,152	5,214	8,017	9,757	11,329	11,080	9,932	7,422	6,518	6,084	91,748
Groundwater Basin Change in Storage	(2,910)	(3,162)	(3,087)	(1,654)	11,932	9,118	3,333	100	(1,002)	(5,360)	(3,986)	(3,483)	(161)

(all values in cfs)

Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Groundwater Basin Recharge													
Unconsumed Ag Water and Precip.	44.5	39.8	31.0	50.7	324.4	312.6	238.5	181.8	150.1	28.5	39.5	39.9	123.4
Supplemental Instream Losses	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Daniels Creek Channel Losses	2.1	1.8	2.6	9.1	0.0	4.6	0.0	0.0	0.0	5.0	3.0	2.4	2.6
Total Groundwater Recharge	46.6	41.6	33.6	59.8	324.4	317.2	238.5	181.8	150.1	33.5	42.6	42.3	126.0
Groundwater Basin Discharge													
Local Drains and Seeps	29.9	31.6	27.1	28.1	41.5	48.5	47.3	45.3	45.8	35.5	34.1	31.2	37.2
Evapotranspiration	0.0	0.0	0.0	0.0	14.8	30.5	38.8	33.4	14.9	0.0	0.0	0.0	11.0
Snake Creek Accretions	9.4	10.1	8.8	8.9	10.6	12.2	11.6	11.2	12.0	10.1	10.1	9.5	10.4
Provo River Accretions	30.9	33.1	28.9	29.6	35.6	39.3	40.2	39.6	40.7	35.8	34.4	31.9	35.0
Deer Creek Reservoir Accretions	23.7	23.7	18.9	21.0	27.8	33.5	46.3	50.7	53.6	39.3	30.9	26.3	33.0
Total Groundwater Discharge	93.9	98.5	83.8	87.6	130.4	164.0	184.2	180.2	166.9	120.7	109.5	98.9	126.6
Groundwater Basin Change in Storage	(47.3)	(56.9)	(50.2)	(27.8)	194.1	153.2	54.2	1.6	(16.8)	(87.2)	(67.0)	(56.6)	(0.6)

Notes:

*Based on MODFLOW model output for baseline level of development assumptions.

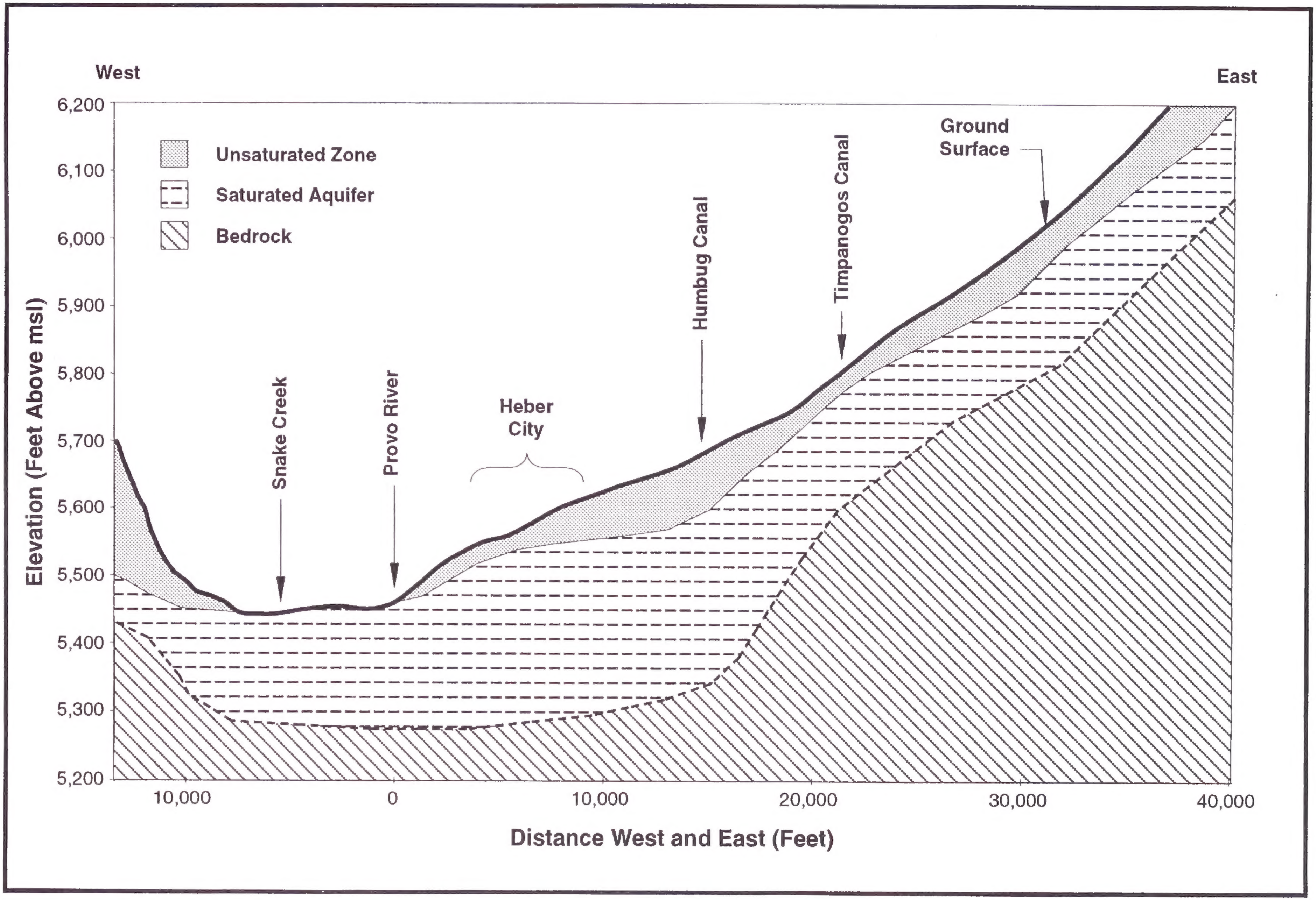


Figure 3-1
Generalized Hydrogeologic Profile of Southern Portion of Heber Valley

Reservoir on the east side of the Provo River, except for the area near Heber City where groundwater flows toward the northeast to Spring Creek. Groundwater is in contact with the surface in many places in the valley — most predominantly in the North Fields Irrigation Company. Wetlands, springs and seeps occur at locations such as these.

Seasonal groundwater levels fluctuate from 5 to 15 feet and up to 30 feet from year to year. Groundwater levels are highest between June and October and lowest between January and April. The groundwater levels are highly dependent on irrigation recharge and thus fluctuate in response to irrigation.

3.2.5.2.3 Wells and Springs. About 640 active and inactive water supply wells — most of them 100 to 250 feet deep — are scattered throughout the Valley. Depth to water in these wells ranges from less than 10 feet to more than 250 feet. The total pumping by all of the wells in the valley averages a combined total of about 1.2 cfs, or 870 acre-feet per year (UDNR 1991). Nearly all wells are used for single-family domestic and livestock purposes. Domestic well pumping is typically restricted to less than 1.5 acre-feet per family by the Utah Division of Water Rights.

The valley contains several springs of both cool, fresh water and hot mineral water. The hot mineral water is believed to originate deep below the valley's fresh-water aquifer, and/or from walls of consolidated bedrock. Therefore, it is believed that groundwater level changes in the aquifer do not affect flows in the hot springs. The fresh-water springs range from just a few gallons of water per minute to over 6,000 gallons per minute (at the Midway Fish Hatchery spring in the southwestern part of the valley). Some of the cool, fresh-water springs are directly fed by groundwater in the aquifer.

3.2.6 Impact Analysis

3.2.6.1 Significance Criteria

Water supply availability impacts were considered significant if agricultural or M&I water supplies downstream of Deer Creek Reservoir would be reduced.

Impacts on agricultural water supplies in Heber Valley were considered significant if an action would result in an increase in shortages compared to existing conditions. Impacts on wells were considered significant if a well became incapable of producing water. Any decrease in the flow of a spring used for water supply or which supports aquatic life was considered to be potentially significant.

Significance criteria for the other surface water and groundwater impact topics are not needed because the modeled impacts defined by this analysis are used by other resource topics to determine the significance of the impacts. These other hydrology-related resource topics include water quality, aquatic resources, wetlands, T&E species and recreation.

3.2.6.2 Potential Impacts Eliminated From Further Analysis

None of the water resources potential impacts raised during the scoping and listed in Section 3.2.3 were eliminated from further analysis.

3.2.6.3 Proposed Action (Riverine Habitat Restoration)

The following subsections describe potential water resource impacts from construction and operation of the Proposed Action.

3.2.6.3.1 Surface Water Impacts. Under the Proposed Action, realignment of the Provo River would lengthen the channel from 10.3 miles to about 12.1 miles. The change in channel slope and cross-section geometry would reduce average flow velocity. Time of travel of the flow from Jordanelle to Deer Creek reservoirs would increase from 3.9 hours to 4.9 hours at a flow rate of 500 cfs. This is the typical flow rate when releases of Central Utah Project (CUP) M&I water from Jordanelle Reservoir would be made to users below Deer Creek Reservoir. Since releases from Jordanelle Reservoir would generally not change abruptly from day to day, the increased time of travel would not change the release pattern from Jordanelle to Deer Creek reservoirs.

3.2.6.3.2 Groundwater Impacts. Changes in river grade and alignment under the Proposed

Action would impact infiltration and discharge of water along the Provo River channel. There would be no overall loss or gain of surface water to groundwater. However, in the northern part of the valley along the Provo River, river seepage could increase as the surface area of the stream bed increases, slightly raising groundwater levels 1-3 feet in the northern most mile of the river. This additional seepage could occur where the stream bed is in a "losing" reach of the river (i.e., the stream bed is higher than groundwater and river water is seeping into the ground under baseline conditions).

The river in this area (Reaches 8 and 9; see Map 3-1) is incised because of erosion and downcutting of the river channel invert. Under the Proposed Action, the channel invert would be raised and the flow of the river would not be confined within existing dikes. Groundwater levels are shallow in the area and would likely adjust to match the grade of the river. Groundwater levels would depend on the final design grade of the river. Groundwater levels would not change if the final grade is similar to the present channel elevation.

Conversely, groundwater is discharging to the river in the south-central part of the valley, one to two miles upriver from Deer Creek Reservoir along the Provo River. In this "gaining" reach of the river (where the stream bed is lower than surrounding groundwater), groundwater discharge could increase and groundwater levels would likely be lower than under baseline conditions by up to 1 foot.

Groundwater recharge in the areas of Heber Valley not adjacent to the Provo River would be the same as under baseline conditions. Groundwater discharge would be impacted by changes in the grade of the river channel in areas where the groundwater table is directly related to the stage (depth of flow) of the river. The average groundwater discharge impacts in Heber Valley along the Provo River under the Proposed Action are less than one-tenth of 1 percent greater than baseline, as shown in Table 3-4).

During a dry year, there would be a small decrease in groundwater basin discharge (approximately 40 acre-feet). The dry year decrease in discharge would be offset by a comparable increase in discharge during wet years, resulting in no net loss or gain over an extended period. The increased loss of 40 acre-feet during a dry year represents less than 0.02 percent of the total flow of the river, which is far less than the accuracy of methods used to measure water flow.

The changes in groundwater levels, storage and discharge summarized above would not impact wells and springs in Heber Valley.

3.2.6.3.3 Impact Summary. Surface water travel time would have an average increase of about 1 hour (at 500 cfs) for flows from Jordanelle to Deer Creek reservoirs because of the longer channel and slower flow velocities. During a dry year, the increased length of river channel would cause an estimated increase of 40 acre-feet in net river channel seepage to groundwater. The greatest changes in groundwater levels would be an increase of about 1-3 feet in the northern portion of the valley adjacent to the river. These groundwater level increases would be associated with changes in the grade and length of the river channel, which affects the surface area and seepage interaction between the river and groundwater basin.

3.2.6.4 Existing Channel Modification Alternative

The following subsections describe potential water resource impacts from construction and operation of the Existing Channel Modification Alternative.

3.2.6.4.1 Surface Water Impacts. Under the Existing Channel Modification Alternative, a series of step-pool reaches would be constructed in the existing river corridor, which would slow the velocity of flow in the pool reaches. Time of travel of the flow from Jordanelle to Deer Creek reservoirs would increase from 3.9 hours to 4.1 hours at a flow rate of 500 cfs.

3.2.6.4.2 Groundwater Impacts. No impacts on groundwater levels, return flows or wells and springs would occur under the Existing Channel Modification Alternative.

3.2.6.4.3 Impact Summary. Surface water impacts would be limited to an average increase of about 12 minutes in the time of travel of flows from Jordanelle to Deer Creek reservoirs. No quantifiable changes in groundwater levels, recharge or discharge would occur.

Table 3-4
Modeled Groundwater Recharge and Discharge Impacts
Under the Proposed Action (Riverine Habitat Restoration)
(Average Conditions*)

Category	Baseline (ac-ft)	Recharge/ Discharge (ac-ft)	Change from Baseline (ac-ft)	Change from Baseline (%)
Groundwater Basin Recharge				
Unconsumed Agriculture Water and Precipitation	89,749	89,749	0	0.0%
Supplemental Instream Losses	0	0	0	0.0%
Daniels Creek Channel Losses	1,838	1,838	0	0.0%
Total Groundwater Recharge	**91,587**	**91,587**	**0**	**0.0%**
Groundwater Basin Discharge				
Local Drains and Seeps	26,915	26,595	(320)	-1.2%
Evapotranspiration	8,053	7,926	(127)	-1.6%
Snake Creek Accretions	7,512	7,502	(10)	-0.1%
Provo River Accretions	25,351	25,884	533	2.1%
Deer Creek Reservoir Accretions	23,917	23,839	(78)	-0.3%
Total Groundwater Discharge	**91,748**	**91,746**	**(2)**	**0.0%**
Groundwater Basin Change In Storage	**(161)**	**(159)**	**2**	**1.2%**

Note:

*Average conditions are the average hydrologic conditions over a 40-year period.
( ) Parenthesis denotes a negative value.

3.2.6.5 Instream Structures Alternative

The surface water and groundwater impacts of this alternative would be nearly identical to the impacts of the Existing Channel Modification Alternative described in Section 3.2.6.4. This alternative would not cause any adverse water resource impacts.

3.2.6.6 No Action Alternative

The No Action Alternative would have no impacts on water resources. The baseline water resource conditions described in Section 3.2.5 would continue under the No Action Alternative.

3.3 Water Quality

3.3.1 Introduction

This analysis addresses potential impacts on water quality from the construction and maintenance of the PRRP. The information and analysis documented in this section was summarized from the Water Quality Technical Report (Mitigation Commission 1997c), which is available from the Mitigation Commission upon request. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.2. This section focuses on the primary types of water quality impacts that could occur from surface water and groundwater changes caused by the Proposed Action and alternatives.

The following water quality topics are addressed in the impact analysis:

- Water quality in the Provo River
- Water quality in Deer Creek Reservoir

3.3.2 Issues Eliminated From Further Analysis

The following issue was eliminated from further analysis.

- Groundwater Quality

The PRRP groundwater analysis concluded the Proposed Action would cause minor changes to groundwater levels in two isolated areas along the river channel. These changes are too minor to cause groundwater quality impacts. Other PRRP alternatives would not cause any groundwater changes. Therefore, groundwater quality is not an issue.

3.3.3 Issues Addressed in the Impact Analysis

The following surface water quality issues were identified during scoping and are addressed in the impact analysis:

- What impacts would occur to water quality from repeated maintenance that could be required with the Proposed Action?
- What impacts would the PRRP have on existing septic tanks located near the Provo River, and how would water quality be affected? How close to the river could septic tanks be safely located without affecting water quality?
- How would construction of the Proposed Action affect water quality?
- How would the Proposed Action affect water quality and sediment in Deer Creek Reservoir?
- What water quality impacts would occur from increased human waste due to recreational use?

3.3.4 Description of Impact Area of Influence

The PRRP water quality impact area of influence is the Provo River between Jordanelle Reservoir and Deer Creek Reservoir as shown on Map 3-1 in Section 3.1.1.1.

3.3.5 Affected Environment (Baseline Conditions)

This section defines the water quality environment that would be affected by the Proposed Action and alternatives for the Provo River and for Deer Creek Reservoir. The affected environment is also referred to as baseline conditions.

Previous studies indicate that Heber Valley has some water quality problems, primarily elevated levels of

phosphorus along the Provo River and in Deer Creek Reservoir (EWPE 1993, 1994; Sowby and Berg 1984). Phosphorus levels in Deer Creek Reservoir in the past have exceeded the Jordanelle Technical Advisory Committee (JTAC) target recommendations for phosphorus, occasionally creating conditions that negatively affect recreational and aesthetic uses of the reservoir, as well as taste and odor problems in potable water supplies.

Deer Creek Reservoir is mesotrophic, meaning it has intermediate nutrient availability and biological productivity. Phosphorus is believed to be the limiting nutrient for algae productivity in the reservoir (Woodward-Clyde 1995), and concentrated efforts have been made to reduce phosphorus loading to control nuisance algae blooms (Loveless 1993). As a result of these efforts, nutrient water quality conditions in Heber Valley and Deer Creek Reservoir have been improving during the past 15 years and reservoir conditions now meet state water quality standards.

Construction of Jordanelle Reservoir is predicted to improve water quality in Heber Valley canals and streams and Deer Creek Reservoir, including reductions in sediment and phosphorus loads (Sowby and Berg 1984). The reservoir was constructed with a Selected Level Outlet Works (SLOW) to help protect downstream water quality by allowing water to be selectively discharged from different layers in the reservoir based on temperature. The water quality improvements predicted by Sowby and Berg (1984) were incorporated into the following baseline conditions. Sowby and Berg projected a reservoir TP concentration of 39 mg/l without sediment. They projected sedimentation at approximately 50 percent per year correcting the projected concentration of 39 mg/l for 50 percent sedimentation yields, an in-reservoir TP concentration of 20 mg/l. This value closely matches the 1993 monitored epilimnetic concentration of 21 mg/l TP (EWPE 1994).

3.3.5.1 Groundwater Quality

Baseline groundwater quality was estimated using existing groundwater quality data and projected changes in irrigation volumes and irrigation water quality. The estimated groundwater total phosphorus (TP) and nitrate (NO_3) concentrations for an average water year are 0.046 and 1.2 mg/L, respectively. The standard deviation (i.e., a measure of the variability of the data) for NO_3 concentrations is 0.8 mg/L, and the maximum monitored concentration is 3.2 mg/L (Hansen, Allen, and Luce 1994).

3.3.5.2 Provo River

3.3.5.2.1 Nutrients and Sediment. Baseline concentrations of TP, total suspended solids (TSS) and NO_3 in valley streams and canals are presented in Table 3-5. The effects of existing nonpoint source pollution activities in Heber Valley are reflected in the existing monitoring data, and therefore are reflected in baseline conditions presented in Table 3-5. Nonpoint source pollution causing activities in the valley that influence water quality are primarily agricultural, but also include urban runoff. For example, the high nutrient and TSS concentrations found in lower Lake Creek reflect the nearby corrals, winter accumulation of pollutants that discharge to the creek during snowmelt and early spring, and urban runoff from Heber City. One additional change under baseline conditions would be the acquisition and fencing of about 14.9 acres of agricultural land. Fencing would exclude livestock and reduce TP loads in the river by about 22 kg/yr (48 lbs/yr). This reduction is less than 0.2 percent of the annual TP load in the river and would not affect baseline concentrations.

3.3.5.2.2 Temperature. Table 3-6 shows the equilibrium water temperatures for the Provo River above Deer Creek Reservoir in late summer under baseline conditions, along with the percentage of each reach that has riparian vegetation. These temperatures were estimated from summer-monitored temperature in Reach 2 when flows in the river were similar to late-summer (August) flows predicted by the water resources analysis, so the analysis incorporates the effects of the 125 cfs minimum flow.

3.3.5.3 Deer Creek Reservoir

3.3.5.3.1 Sediment. Table 3-7 summarizes baseline TSS and TP loads to Deer Creek Reservoir from the Provo River, groundwater return flow and Daniels Creek during average hydrologic conditions. The sum of the loads from the three sources equals the total baseline load from the impact area of influence to Deer Creek Reservoir. The Provo River contributes a majority of the TSS and TP loads to the reservoir from the impact area of influence.

Table 3-5
Average Year Baseline TSS, TP and NO3 Concentrations in Impact Area of Influence Streams
(Milligrams per Liter)

Location	TSS[a]	TP[b]	NO_3[c]
Jordanelle Reservoir Releases	0.8	0.021	0.034
Provo River Inflow to Deer Creek Reservoir	10.9	0.036	0.17
Spring Creek at the Provo River	39.6	0.091	0.31
Lower Daniels Creek	54.4	0.117	0.67
Daniels Creek at 1st Diversion	27.9	0.038	0.19
Rock Ditch at River Road	4.7	0.044	0.069
Lower Lake Creek	201	0.351	0.71

Notes:
[a]TSS = Total Suspended Solids
[b]TP = Total Phosphorus
[c]NO3 = Nitrate

Table 3-6
Baseline Temperatures by Reach in the Provo River

Reach*	Percent of Reach with Riparian Shading	Temperature °F
2	66	55.7
3	86	53.1
4	64	56.0
5	40	59.1
6	77	54.8
7	92	52.3
8	75	54.5
9	85	53.2

Note:
*Reach 1 was not assessed because riparian vegetation in this reach would not be affected under the Proposed Action and alternatives.

Table 3-7
Baseline TSS and TP Loads to Deer Creek Reservoir
(Kilograms per Year)

Water Year Type and Parameter	Provo River	Groundwater Return Flow[1]	Daniels Creek	Total
Average				
TSS[2]	3,560,950	0	563,450	4,124,400
TP[3]	11,860	1,360	1,210	14,430
Dry				
TSS	2,405,780	0	393,180	2,798,960
TP	8,435	1,535	850	10,820
Wet				
TSS	4,766,900	0	1,342,170	6,109,070
TP	15,850	1,180	2,890	19,920

Notes:
[1]Groundwater for load analysis based on predicted concentrations.
[2]TSS = Total Suspended Solids
[3]TP = Total Phosphorus

3.3.5.3.2 Eutrophication. Excess TP in reservoirs and other waters is a primary factor that can lead to eutrophication. The estimated average annual TP concentration in Deer Creek Reservoir using the phosphorus sedimentation model for average hydrologic and baseline conditions is 0.031 mg/L.

3.3.5.2.3 Temperature and Mixing Status. Under existing conditions Deer Creek Reservoir is dimictic (i.e., the reservoir mixes vertically once in the spring and once in fall). Vertical mixing during mid- to late summer is prevented by thermal stratification. Stratification begins in June, is pronounced through July and August, then lessens in September. The entire water column starts to reach similar temperatures before turnover in late September or early October (Woodward-Clyde 1995, EWPE 1994).

The PROSIM model, described in Section 3.2 and Appendix B.2.1.2.1, modeled average Deer Creek Reservoir surface elevation for baseline conditions at 5,397 feet. The minimum elevations modeled for July and August over the 30-year record modeled, are 5,338 and 5,330 feet, respectively. The baseline average depth is 117 feet, and minimum depths are 58 feet for July and 50 feet for August. All of these elevations are sufficient to maintain maximum water depths greater than the 33 feet found by Heiskary and Wilson (1990) as the depth necessary to maintain temperature stratification.

3.3.6 Impact Analysis

3.3.6.1 Significance Criteria

The following significance criteria were developed:

- The significance criterion for nitrate (NO_3) concentrations in the Provo River was assessed based on the State of Utah Water Quality Standard for Aesthetics and Aquatic Wildlife of 4 mg/l (Utah Department of Environmental Quality 1991), with a change in nitrate (NO_3) concentration exceeding this concentration considered significant.

- An increase in Deer Creek Reservoir TP concentrations of 0.002 mg/l is significant because it could cause eutrophication.

- Water quality in Deer Creek Reservoir is a function of the reservoir's mixing status (the frequency at which water mixes vertically). Resistance to and the frequency of mixing is

determined by thermal stratification, which occurs when a temperature gradient develops in the reservoir and the difference in density of the layers temporarily prevents mixing. Deeper layers of stratified lakes can be major sources of TP to surface layers when mixing occurs. The water quality issue related to Deer Creek Reservoir temperature is a potential change to the reservoir's stratification during late summer. Late summer mixing would allow the release of phosphorus-rich bottom water to the surface where the phosphorus could promote algae blooms. Therefore, significance criteria of reservoir temperature and mixing status were assessed based on changes to the inflow temperature of the Provo River and maintaining a minimum reservoir depth of about 33 feet. This depth would be necessary for strong thermal stratification during critical late summer periods (Heiskary and Wilson 1990). Deer Creek Reservoir modeling by Woodward-Clyde (1995) indicated that temperatures in the reservoir near the dam are only marginally affected by changes of 18°F or less in the inflow temperature of the Provo River. Therefore, changes to reservoir temperature and mixing status are significant if reservoir depth drops below 33 feet during critical late summer periods and/or Provo River inflow temperatures increase by 18°F or more.

Since there are no state standards for TP and TSS concentrations and loads, no significance criteria for these parameters were developed. Water quality significance criteria were not developed for stream temperatures. Significance for stream temperature is addressed in the Aquatic Resources analysis in Section 3.5.6.1 of Chapter 3 of the PRRP EIS.

3.3.6.2 Potential Impacts Eliminated From Further Analysis

The following water quality issues have been eliminated from further analysis:

- What impacts would occur on water quality from repeated maintenance that could be required with the Proposed Action (Riverine Habitat Restoration) and other alternatives?

  The Proposed Action has been designed to complement natural fluvial and morphological characteristics and to avoid repeated maintenance. Therefore, maintenance is not a water quality issue under the Proposed Action. The Existing Channel Modification and Instream Structures Alternatives require occasional maintenance to reconstruct project features damaged by high flows. However, the expected frequency of such events is low (once every 5 to 10 years), and the extent of disturbance caused by maintenance activities would be minor.

- What water quality impacts would occur from increased human waste due to recreational use?

  Baseline as well as the Proposed Action and alternatives have access points which include restroom facilities. In addition the potential nutrient load from human waste directly entering the river from recreation activities is small compared to the loads in the river. Therefore, human waste from increased recreational activities is not a water quality issue under the Proposed Action or alternatives.

3.3.6.3 Proposed Action (Riverine Habitat Restoration)

The following sections define potential water quality impacts from construction and maintenance of the Proposed Action by impact topic.

3.3.6.3.1 Provo River. The following subsections describe potential water quality impacts on the Provo River under the Proposed Action.

3.3.6.3.1.1 Nutrients and Sediments. Nutrient and sediment concentrations in the Provo River would be affected by construction activities and changes in land use along the river corridor under the Proposed Action.

Construction activities could potentially encounter septic systems, but the number in the construction area is minimal (Hansen, Allen, and Luce 1994) and the PRRP design criteria require construction to be a minimum of 200 feet from any residence. Therefore, the chances of construction activities affecting septic systems are minimal, and the PRRP is not expected to cause an increase in TP and NO_3 migration from septic systems to the Provo River.

Water quality impacts from encountering septic systems under the Proposed Action would not occur.

Construction of the Proposed Action may cause soil erosion, which would lead to increases in sediment and associated nutrient concentrations in the Provo River. However, construction activities would cause only negligible amounts of soil to enter the Provo River (see Section 3.8, Soil Resources), based on the methods that would be used to construct this alternative (see PRRP EIS Section 1.5.4 of Chapter 1 for a description of construction procedures, and PRRP EIS Section 1.9.6.1 for Standard Operating Procedures). The Proposed Action also would be completed in stages, and the amount of construction at any one time would be kept to a minimum. Thus, the Proposed Action could result in an a slight increase in sediment and associated nutrients during and immediately after construction, but it would not be significant.

A total of 314 acres of irrigated and nonirrigated agricultural land would be acquired above the acreage acquired under baseline (see Table 3-35 in Section 3.11 of Chapter 3 of the PRRP EIS). This land would be fenced, which would exclude livestock and reduce TP loads by an estimated 465 kg/year (1,024 lb/year). This is about seven percent of the average annual TP load in the Provo River, which would reduce Provo River average annual TP concentrations by less than 0.002 mg/L. This impact would not be significant but would slightly improve water quality compared to baseline conditions. Land acquisition and fencing also would be expected to cause slight long-term reductions in TSS and NO_3 concentrations.

Ponds created within the floodplain of the Core Area and Expanded Restoration Area under the Proposed Action also may lead to water quality improvements in the Provo River. Five to ten small ponds, 10 to 15 feet deep and with a total surface area of 12.6 acres, are proposed (see PRRP EIS Section 1.5.2.1 of Chapter 1 for locations). Although these depths would be sufficient to provide sedimentation and storage of TSS and TP, the storage levels cannot be measured and the benefit would be small relative to overall loads and concentrations in the Provo River.

3.3.6.3.1.2 Temperature. Incident solar radiation on the Provo River would increase under the Proposed Action as cottonwood trees and other types of riparian vegetation are removed, meanders are re-established and the river is lengthened. These changes would increase water temperatures until new trees and other vegetation growing under this alternative become established. New cottonwood trees would mature in about 15 to 30 years as described in Section 3.4.6.3.3, Wetland Resources. Table 3-8 shows the potential water temperature increases in the Provo River from these activities during July of a dry year. Water temperature changes in Reach 1 were not estimated since changes to riparian vegetation in this reach are not part of the Proposed Action. Estimated water temperature increases range from 1.2°F in Reach 5 to 6.2°F in Reach 8. The significance of these changes is described in Section 3.5.6.3.1.1, Aquatic Resources.

Temperature increases in side channels in individual reaches are expected to be negligible because narrow side channels (2 to 3 feet wide) would receive significant shade from grasses and riparian vegetation. This would limit the exposure to solar radiation. Temperature increases in the river are less than 0.3°F using worst-case mixing and dilution calculations from side-channel contributions.

Under the Proposed Action the enhanced riparian corridor would provide more effective shading, which would return water temperatures to baseline levels or slightly lower after vegetation is re-established. The significance of this decrease is described in Section 3.5.6.3.1.1, Aquatic Resources.

3.3.6.3.2 Deer Creek Reservoir. The following subsections describe potential water quality impacts on Deer Creek Reservoir under the Proposed Action.

3.3.6.3.2.1 Sediment. Minor sedimentation increases in Deer Creek Reservoir during and immediately after construction would be the same as described for the Provo River in Section 3.3.6.3.1.1. However, sediment loads would decrease after construction is completed and land acquired for access is fenced. These reductions would have a positive impact.

3.3.6.3.2.2 Eutrophication. The Proposed Action would cause minor increases of TP in the Provo River during and immediately after construction (as described in Section 3.3.6.3.1.1). If these minor increases were to occur during the July through September period effects in Deer Creek Reservoir might be different and could exacerbate existing blue-green algae blooms. Therefore, construction

Table 3-8
Proposed Action Temperatures and Impacts by Reach in the Provo River

Reach*		Temperature, ° F
Reach 2	Baseline	55.7
	Proposed Action	61.3
	Difference	5.6
Reach 3	Baseline	53.1
	Proposed Action	56.5
	Difference	3.4
Reach 4	Baseline	56.0
	Proposed Action	58.7
	Difference	2.7
Reach 5	Baseline	59.1
	Proposed Action	60.3
	Difference	1.2
Reach 6	Baseline	54.8
	Proposed Action	60.5
	Difference	5.7
Reach 7	Baseline	52.3
	Proposed Action	58.3
	Difference	6.0
Reach 8	Baseline	54.5
	Proposed Action	60.7
	Difference	6.2
Reach 9	Baseline	53.2
	Proposed Action	58.0
	Difference	4.8

Note:

*Reach 1 was not assessed because the Proposed Action and alternatives do not affect riparian vegetation in this reach

impacts on sediment and associated TP inputs will be minimized during this period by the construction SOPs (see Section 1.9.6.1 of Chapter 1). This is not considered significant since it would not increase annual reservoir TP concentrations.

Fencing of land to be acquired under the Proposed Action would cause a minor decrease in TP loads to the reservoir of about 465 kg/year (1,024 pounds). This would not change TP concentrations in Deer Creek Reservoir, since it is less than 3 percent of the average annual baseline load to the reservoir.

3.3.6.3.2.3 Reservoir Temperature and Mixing Status. The Proposed Action would not change the hydrology of Deer Creek Reservoir because it would not change inflow and outflow characteristics of the reservoir from baseline conditions. Therefore, changes in reservoir depth or storage under the Proposed Action would not affect stratification and mixing in the reservoir.

The Proposed Action could temporarily increase inflow temperatures from the Provo River under late summer, dry-year conditions. However, the temperature increase in Reach 2 (closest to Deer Creek Reservoir) of 5.6°F would be less than the significance criteria of an 18°F change from baseline conditions. Therefore, changes in inflow temperature of the Provo River under the Proposed Action would not affect stratification or mixing in Deer Creek Reservoir.

3.3.6.3.3 Impact Summary. The following water quality impacts would occur under the Proposed Action:

- The Proposed Action would cause a minor increase in TSS and TP concentrations in the Provo River during and immediately after construction. However, the SOPs would prevent significant impacts. TSS and TP concentrations in the river would decrease slightly after construction and fencing of acquired land is completed. This would have a positive impact.

- Until new vegetation is established, the loss of riparian vegetation and associated shading and the addition of more river surface area could increase late summer stream temperatures from 1.2°F in Reach 5 to 6.2°F in Reach 8. Water temperatures would decrease to or slightly below baseline levels after vegetation matures. The significance of these changes is evaluated in Section 3.5, Aquatic Resources.

- A minor increase in annual TSS loads to Deer Creek Reservoir would occur during and immediately following construction. However, the SOPs are expected to prevent significant impacts. TSS loads to the reservoir would decrease slightly after construction and fencing of acquired land is completed. This would have a positive impact.

- A minor increase in annual TP loads to Deer Creek Reservoir would occur during and immediately after construction. However, SOPs are expected to prevent significant impacts. TP loads to the reservoir would drop by about 465 kg/yr (1,024 pounds) after construction and fencing of acquired land is completed. This reduction would not change the average annual TP concentration in the reservoir significantly.

- The Proposed Action would not change the mixing status or stratification of Deer Creek Reservoir.

3.3.6.4 Existing Channel Modification Alternative

The following sections define potential water quality impacts from construction of the Existing Channel Modification Alternative by impact topic.

3.3.6.4.1 Provo River. The following subsections describe potential water quality impacts on Deer Creek Reservoir under the Existing Channel Modification Alternative.

3.3.6.4.1.1 Nutrients and Sediments. Construction of this alternative would cause soil erosion, leading to increases in TSS and TP concentrations in the Provo River. However, the Soil Resources analysis (Section 3.8 of the PRRP EIS) concludes that construction of this alternative would only cause negligible amounts of soil to enter the Provo River. This alternative would acquire only 7.6 acres of agricultural land above that acquired under baseline conditions. This land would be fenced and exclude livestock, but there would be a negligible increase in TP and TSS loads in the Provo River and no change in concentrations. Therefore, the Existing Channel Modification Alternative would cause a minor

increase in TSS and TP concentrations during and immediately after construction, but would not change concentrations over the long-term once construction is complete.

3.3.6.4.1.2 ***Temperature.*** Construction of this alternative would increase Provo River temperatures as described in Section 3.3.6.3.1.2 for the Proposed Action, except temperature increases would range from 0°F in Reaches 4 and 5 to 5.4°F in Reach 8 (see Table 3-9) before returning to approximately baseline levels after vegetation is re-established.

3.3.6.4.2 Deer Creek Reservoir. The following subsections describe potential water quality impacts on Deer Creek Reservoir under the Exiting Channel Modification Alternative.

3.3.6.4.2.1 ***Sediment.*** Minor increases in TSS concentrations to Deer Creek Reservoir during and immediately after construction of this alternative would be the same as described in Section 3.3.6.4.1.1 for the Provo River.

3.3.6.4.2.2 ***Eutrophication.*** Increases in TP loads to Deer Creek Reservoir during and immediately after construction of this alternative are minor as described in Section 3.3.6.4.1.1. These loads would not be significant because they would not increase annual reservoir TP concentrations.

3.3.6.4.2.3 ***Reservoir Temperature and Mixing Status.*** This alternative would not change the hydrology of Deer Creek Reservoir because it would not change inflow and outflow characteristics of the reservoir from baseline conditions. Therefore, changes in reservoir depth or storage under this alternative would not affect stratification and mixing.

Temporary increases of inflow water temperatures from the Provo River would be less than 3.3°F, well below the significance criteria of 18°F. Therefore, the alternative would not change stratification or mixing in Deer Creek Reservoir.

3.3.6.4.3 Impact Summary. The following water quality impacts would occur under the Existing Channel Modification Alternative:

- There would be a minor increase in TSS and TP concentrations in the Provo River during and immediately after construction. However, SOPs would prevent significant impacts.
- Until new vegetation matures, the loss of riparian vegetation and associated shading, along with greater river surface area could increase late summer stream temperatures from 0° in Reaches 4 and 5 to 5.4°F in Reach 8. Water temperatures would drop to near baseline levels after vegetation becomes established. The significance of this change is evaluated in Section 3.5, Aquatic Resources.
- There would be a minor increase in annual TSS loads to Deer Creek Reservoir during and immediately after construction. However, SOPs would prevent significant impacts.
- There would be a minor increase in annual TP loads to Deer Creek Reservoir during and immediately following construction. However, SOPs would prevent significant impacts and the increased loading would not change the average annual TP concentration in the reservoir.

3.3.6.5 Instream Structures Alternative

The following sections define potential water quality impacts from construction of the Instream Structures Alternative by impact topic.

3.3.6.5.1 Provo River. The following subsections describe potential water quality impacts on the Provo River under the Instream Structures Alternative.

3.3.6.5.1.1 ***Nutrients and Sediments.*** Construction of this alternative has the potential to affect nutrient and sediment concentrations in the Provo River, but would not affect adjacent land uses.

Construction could cause some erosion and lead to minor increases in TSS and TP concentrations in the Provo River. However, since construction would be minimal, negligible amounts of soil would enter the Provo River (see Section 3.8, Soil Resources). Therefore, minor increases in TSS and TP during and immediately after construction would not be significant.

3.3.6.5.1.2 ***Temperature.*** This alternative would involve very little clearing of riparian vegetation and would not affect stream temperatures.

Table 3-9
Existing Channel Modification Temperatures and Impacts by Reach in the Provo River

Reach*		Temperature °F
Reach 2	Baseline	55.7
	PRRP ECM	59.0
	Difference	3.3
Reach 3	Baseline	53.1
	PRRP ECM	56.8
	Difference	3.7
Reach 4	Baseline	56.0
	PRRP ECM	56.0
	Difference	0.0
Reach 5	Baseline	59.1
	PRRP ECM	59.1
	Difference	0.0
Reach 6	Baseline	54.8
	PRRP ECM	56.9
	Difference	2.1
Reach 7	Baseline	52.3
	PRRP ECM	56.0
	Difference	3.7
Reach 8	Baseline	54.5
	PRRP ECM	59.9
	Difference	5.4
Reach 9	Baseline	53.2
	PRRP ECM	55.9
	Difference	2.7

Note:

*Reach 1 not assessed because the Proposed Action and alternatives do not affect riparian vegetation in this reach

3.3.6.5.2 Deer Creek Reservoir. The following subsections describe potential water quality impacts on Deer Creek Reservoir under the Instream Structures Alternative.

3.3.6.5.2.1 Sediment. Minor sedimentation in Deer Creek Reservoir during and immediately after construction of this alternative would be the same as described for the Proposed Action in Section 3.3.6.3.1.1.

3.3.6.5.2.2 Eutrophication. Minor increased migration of particulate phosphorus (i.e., that fraction of TP attached or incorporated in particulate matter) to Deer Creek Reservoir during and immediately after construction of this alternative would be the same as described for the Proposed Action in Section 3.3.6.3.2.2.

3.3.6.5.2.3 Reservoir Temperature and Mixing Status. The Instream Structures Alternative would not change the hydrology of Deer Creek Reservoir because the alternative would not change inflow and outflow characteristics of the reservoir from baseline. Therefore, changes in depth or storage under this alternative would not affect stratification and mixing in the reservoir.

This alternative would not affect inflow temperatures from the Provo River. Therefore, temperatures in the reservoir would not be impacted.

3.3.6.5.3 Impact Summary. Water quality impacts under the Instream Structures Alternative would be the same as described for the Existing Channel Modification Alternative in 3.3.6.4.3, except there would be no significant change in the riparian corridor, associated shading or river surface area, so water temperatures would not change from baseline.

3.3.6.6 No Action Alternative

The No Action Alternative would have no impacts on water quality. Baseline water quality conditions would continue as described in Section 3.3.5.

3.4 Wetlands Resources

3.4.1 Introduction

The PRRP wetlands analysis addresses potential impacts on wetlands from the construction, operation and maintenance of the Proposed Action and alternatives. The information and analysis documented in this section were summarized from the Wetlands Technical Report (Mitigation Commission 1997d). The analysis in this section of Chapter 3 focuses on all potential wetland types that could be impacted, including direct, indirect, short-term (during construction) and long-term (permanent) impacts to wet and moist meadows, emergent marshes, shrub wetlands and riparian woodland. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.3.

The following wetland impact topics are addressed in the impact analysis:

- Impacts on wetland types from construction of the PRRP
- Impacts on wetland types from changes in the water table
- Impacts on wetland types from changes in surface-water flow

3.4.2 Issues Eliminated From Further Analysis

None of the wetland issues raised during scoping and defined in Section 3.4.3 have been eliminated from further analysis.

3.4.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- How would construction of the PRRP impact wetlands?
- How would changes in the water table impact wetlands?
- How would changes in surface-water flow impact wetlands?

3.4.4 Description of Impact Area of Influence

The wetland resource impact area of influence consists of about 10 miles of the Provo River corridor between Jordanelle Dam and Deer Creek Reservoir. Map 3-1 in Section 3.1.1.1 of this EIS shows the impact area of influence by river reach.

3.4.5 Affected Environment (Baseline Conditions)

Wetlands types in the Provo River corridor include wet and moist meadows, emergent marshes, shrub wetlands and riparian woodland. Additional information is presented in the following subsection for the riparian woodland community type along the Provo River corridor.

Map A-2 (in pocket at back of Final Wetlands Technical Report) shows the wetland community types and Map 3-1 in Section 3.1.1.1 shows the impact area of influence.

3.4.5.1 Moist Meadow Complex

About 3,084 acres of moist meadow complex were mapped in the Heber Valley, of which 10 percent, or 308 acres, are wetlands existing in most of the flood-irrigated agricultural lands in the North Fields and South Fields regions of the project area of influence. Moist meadow vegetation is primarily composed of grasses and grass-like plants averaging 1 to 4 feet high. The common species include: spreading bentgrass, water sedge, rush, timothy *(Phleum pratense)*, Kentucky bluegrass and white clover *(Trifolium repens)*. Irrigation and sub-irrigation are the primary sources of water for moist meadows. Moist meadow is somewhat drier than wet meadow.

3.4.5.2 Wet Meadow — USBR Wetlands

The USBR wetlands were designed and constructed as mitigation for wet meadow wetland impacts when the Jordanelle Dam and Reservoir were constructed and Highway 40 was relocated. USBR constructed wetland cells on about 134 acres of lands adjacent to the Provo River below the Jordanelle Dam and south of relocated Highway 40. The cells provide open-water habitat (including breeding areas and possibly other life stages for spotted frog), emergent vegetation and sedge meadows, and are separated by constructed dikes. Water rights for the wetlands were secured by USBR when land was purchased at Jordanelle Reservoir. The water supply to individual wetland cells and water levels in each cell are controlled by weirs constructed in the dikes. USBR is continuing its efforts to develop these wetlands to meet the Project 404 Permit stipulations.

3.4.5.3 Emergent Marsh

Emergent marsh occurs in scattered, small areas generally adjacent to agricultural areas. The USBR constructed wetland area provides some emergent marsh habitat. These marshes are 100 percent wetland.

3.4.5.4 Shrub Wetland

Shrub wetlands, dominated by tall shrubs (principally willows), are located in a number of different habitats, including scattered locations adjacent to springs, and along ditches and creeks in wetter, abandoned agricultural lands. These wetlands occur primarily in areas too wet for most land uses, except recreation or wildlife habitat. As mapped, the shrub wetland mapping unit contains 100 percent wetlands. Dominant shrub species include coyote willow *(Salix exigua)*, yellow willow *(Salix lutea)* and river hawthorn *(Crataegus douglasii)*. Dominant herbaceous species are reed canarygrass *(Phalaris arundinacea)*, fowl bluegrass *(Poa palustris)* and duckweed *(Lemna sp.)*.

3.4.5.5 Riparian Woodland

Riparian woodland as mapped for baseline conditions contains 25 percent wetland. Large areas of riparian woodland are found in the following areas: up to 800 feet from the river and levees in the northern part of Heber Valley near the USBR mitigation wetlands; near the crossing by River Road; and from 1 mile upstream to one-half mile downstream of the Midway Road crossing. In other areas, riparian woodlands are mostly confined to a narrow strip along the banks of existing dikes. An estimated 316 acres of riparian woodland currently exist in the impact area of influence. The primary tree species in riparian woodland is narrowleaf cottonwood (*Populus angustifolia*). Other dominant or common trees include boxelder *(Acer negundo)*, crack willow *(Salix fragilis)*, speckled alder *(Alnus incana)* and river hawthorn. Dominant and

common shrub species include red-osier dogwood *(Cornus stolonifera)*, Wood's rose *(Rosa woodsii)*, coyote willow and yellow willow. Common understory species include spreading bentgrass, horsetail *(Equisetum arvense)*, reed canarygrass, fowl bluegrass, European bittersweet *(Solanum dulcamara)* and golden pea *(Thermopsis montana)*. Common upland understory vegetation includes Canada thistle *(Cirsium arvense)*, ryegrasss *(Elymus spp.)*, brome *(Bromus spp.)*, orchard-grass *(Dactylis glomerata)*, bryony *(Bryonia alba)*, timothy, Kentucky bluegrass and false Solomon's seal *(Smilacina spp.)*. Riparian woodlands along the Provo River are natural, but are reduced from larger riparian woodlands that existed 40 years ago, before the river was channelized by the Provo River Channel Revision Project, and interaction with the floodplain was limited. Since the dikes have been constructed, there has been very little new cottonwood tree recruitment in areas separated from the existing channel. Many existing cottonwoods are about the same age. Natural cottonwood recruitment depends on the dynamics of flood flows that cause surface scour and sediment deposition. (Hill et al 1986; Padgett et al 1989; Bradley et al 1985). This interaction has been mostly eliminated since the dikes were constructed.

3.4.6 Impact Analysis

3.4.6.1 Significance Criteria

The wetland significance criteria are based on federal regulations and standards and professional judgment. The following types of impacts on wetlands would be considered significant:

- A net loss of any wetlands area resulting from filling, excavating or draining during construction
- Wetlands functions and values are reduced because of changes in water supply affecting plant communities, groundwater recharge, groundwater discharge, sediment stabilization and wildlife habitat.

The following describes the types of wetland impacts that could occur under the Proposed Action and alternatives:

- Beneficial impacts, which are wetlands and riparian woodlands that would be developed as part of the project construction.
- Direct impacts, which would result from construction activities that physically disturb wetland vegetation, soils and hydrology
- Short-term impacts, which are disturbances to wetlands that would be restored after project construction.
- Long-term impacts, which would result from construction of a permanent project feature (such as the river channel, setback dikes and floodplain construction) in a wetland. Long-term impacts would require mitigation or project wetland benefits to replace impacted areas.

3.4.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential wetland impacts have been eliminated from further analysis.

3.4.6.3 Proposed Action (Riverine Habitat Restoration)

Overall, the Proposed Action would have short-term adverse impacts on 28.2 acres of wetlands during construction, while 80.0 acres of wetlands would be permanently removed and 287.6 acres of integrated riparian woodland, open-water and wet/moist meadow and emergent marsh wetlands would be created. The USBR wetland areas and any cottonwood trees that would be adversely impacted under the Proposed Action are categorized separately. Map A-5 (in map pocket at back of EIS) shows long-term adverse impacts on wetlands (short-term adverse impacts are excluded from the map for clarity). These impacts were based on the feasibility level design (see Chapter 1, Section 1.5). During final design, steps would be taken to reduce the level of wetland impacts to the extent possible. The only beneficial impacts shown on Map A-5 are the ponds and side channels. There would be no significant changes to wetlands from the potential rise in groundwater elevations in Reaches 7, 8 and 9 based on results of the hydrology analysis presented in Section 3.2, Water Resources.

The following subsections describe the direct short and long-term impacts on each wetland type from construction and operation of the Proposed Action.

3.4.6.3.1 Wet/Moist Meadow Complex. The wet/ moist meadow complex is mapped as 80 percent wetland for wet meadows and 10 percent wetland for moist meadows. The adverse impact calculations account for these percentages. A total of 24.0 acres of wet/moist meadow would receive direct short-term impacts during construction of the Proposed Action until they are restored under the SOPs described in Section 1.9.6.1 of PRRP EIS Chapter 1. The short-term impacts would include disturbance and removal of vegetation and soils by construction equipment.

Wetland functions, including groundwater recharge, and wildlife habitat, would be impacted during the short-term until the wetlands are restored to a functioning state.

Under the Proposed Action, 62.0 acres of wet/moist meadow wetlands would be removed by the construction of the river channel, floodplain construction and placement of setback dikes. This includes 25.9 acres of the USBR replacement wetlands developed as mitigation for the Jordanelle Dam project. About 10.8 acres of mitigation wetlands would be removed in the southern replacement wetland cells below the US Highway 40 overpass and 15.1 acres would be removed in the northern cells below Jordanelle Dam. It should be noted that this analysis uses the total acreage of USBR constructed wetland cells that would be impacted by the Proposed Action as wetland type. Actually, only 54 percent of the area is wetland habitat. The other 46 percent is comprised of dikes, upland habitats, and water control features of the constructed area. This analysis therefore represents a maximum level of impact, which would be reduced upon implementation. Map A-5 (in map pocket at back of EIS) shows the impacted portions of the USBR replacement wetlands. The remaining 36.1 acres of wet/moist meadow permanently removed under the Proposed Action are scattered throughout the nine PRRP reaches (see Map A-5 in pocket at back of EIS). Proposed mitigation for these impacts is described in Section 3.19.2.

Aside from the USBR replacement wetlands, impacted wet/moist meadow wetlands have functional values ranging from very low to relatively high. Low-value wetlands that would be removed by construction of the Proposed Action are comprised of irrigated agricultural fields used mainly for hay production and pasture. These wetlands have the following characteristics: 1) they are relatively flat and interspersed throughout upland areas; 2) wetland species are dominated by Nebraska sedge, Kentucky bluegrass and reed canary grass; 3) the water source consists of flood irrigation or irrigation drainage and return flow that collects on the surface in some cases because it is blocked by dikes from reaching the river; and 4) many of the low-functioning agricultural wetlands are grazed by livestock. Higher-value wetlands are composed of a mosaic of wetland community types that include diverse topography, a wide range of water regimes, organic soils and a diversity of plant communities (see Figure 1-5 and Table 1-1 in Chapter 1 for a description of these wetland subtypes). Some wet/moist meadow wetlands provide potential habitat for threatened, endangered and candidate species, including Ute Ladies'-tresses, peregrine falcon and spotted frog (see Section 3.7, Threatened, Endangered, and Candidate Species).

Approximately 14.4 acres of wet/moist meadow complexes would be enhanced by running water through about 9.5 miles of side channel, which would increase soil moisture in adjacent banks to support wet meadow vegetation. The enhancement would likely occur over two to three growing seasons as the vegetation responds to the increased soil moisture. The 14.4 acres includes the channel and a strip of enhanced vegetation estimated for calculation purposes to be 5 feet wide. In reality, enhanced vegetation would be wider in some locations and narrower in others depending on the micro-topography, channel slopes, soils and vegetation species. The side channels are expected to support vegetation overhanging the channel banks and lining the channel bottom because livestock grazing would be eliminated in these areas and flow velocities would be low. The 14.4 acres of wet/moist meadow that would be enhanced would provide potential habitat for threatened, endangered and candidate species, including Ute Ladies'-tresses, peregrine falcon and spotted frog (see Section 3.7 Threatened, Endangered, and Candidate Species).

3.4.6.3.2 Emergent Marsh. A total of 0.3 acres of emergent marsh vegetation, soils and hydrology would be temporarily disrupted to develop a floodplain and to construct the new river channel under the Proposed Action. Wetland functions, including groundwater recharge and wildlife habitat,

would be impacted for 2 years until the emergent marsh areas are restored to a functioning state.

Excavation of the new channel and placement of fill in emergent marsh wetlands for construction of new set-back floodplain dikes would permanently eliminate 0.8 acres of emergent marsh. Highly rated wetland functions that would be eliminated include groundwater discharge, wildlife diversity and heritage.

An estimated 4.3 acres of emergent marsh would be created over an estimated three years within constructed wetlands and around the perimeter of open-water ponds under the Proposed Action. The estimated acreage was calculated from the conceptual layout (See Map A-5 in pocket at the back of EIS). These pond and emergent marsh sizes and locations are conceptual, therefore the actual acreage could be different after final design. Wetland functions such as water treatment, sediment stabilization, and wildlife and aquatic habitat would develop as these wetlands mature into functioning ecosystems.

3.4.6.3.3 Riparian Woodland. About 13.3 acres (4.2 percent) of riparian woodland and an additional 973 mature cottonwood trees would be permanently lost when dikes are removed and the existing river channel is abandoned during construction of the Proposed Action. During final design, impacts on cottonwood trees would be avoided when feasible which would likely reduce the number of mature cottonwood trees impacted to less than 800. Highly rated wetland functions that would be impacted include sediment stabilization, wildlife diversity and heritage.

About 251.0 acres of riparian woodland habitat would be created naturally along the banks of the new river channel and on about 50 percent of the 2-year floodplain for a net increase of 237.7 acres (+75 percent) compared to baseline. Under the operation of Jordanelle Reservoir, the 2-year floodplain would be inundated every other year at average flow depths ranging from 0.1 to 0.5 feet and average velocities ranging from 0.5 to 1.5 feet per second. Topographic variations (e.g., depressions, traces of abandoned channels and obstructions such as trees) would cause localized areas of greater depths and velocities. The assumption was made that these flows would develop soil and hydrology conditions to support natural recruitment of cottonwood and willow species. It would take an estimated 15 to 30 years for cottonwood trees to mature to levels comparable to existing trees being removed. However, cottonwood recruitment would occur incrementally over a number of overbank flood cycles, resulting in a riparian zone of various heights and stages of development rather than a strip of vegetation that is all similar in age and development as presently exists. Creation of a successional riparian zone would produce a complex riparian vegetation zone with diverse wildlife and aquatic habitats in the long term.

3.4.6.3.4 Shrub Wetland. A total of 3.9 acres of shrub wetland would be removed or disturbed during construction of the Proposed Action. Short-term impacts include removal or disturbance of vegetation, soils and hydrology during construction of the new river channel, floodplain and setback dikes. After construction is completed the impacted areas would be restored under the SOPs described in Section 1.9.6 of Chapter 1. Highly rated wetland functions, including sediment stabilization and wildlife habitat values, would be impacted during construction and until the shrub wetland areas are restored over 3 to 5 years.

A total of 3.9 acres of shrub wetland would be permanently removed when existing dikes are removed and the existing river channel is abandoned. Construction would remove dogwood, willows and herbaceous understory vegetation, primarily in Reaches 3 through 6. Highly rated functions of these shrub wetlands, sediment stabilization and wildlife diversity/abundance would be eliminated during construction of the Proposed Action.

An estimated 9.6 acres of new shrub wetlands would likely establish on point bars and terraces as the new channel develops into a functioning river system. This is about half of the total point bar area that is estimated would be created under the Proposed Action. The remaining point bar area would be subject to flooding levels and flow velocities unfavorable for maintaining shrub vegetation.

3.4.6.3.5 Open Water. About 0.5 acres of open water ponds would be removed by the Proposed Action. About 12.6 acres of open-water ponds would be constructed (some in conjunction with side channels) under the Proposed Action. The wetland and pond depths described in Chapter 1 (Figure 1-5 and configurations shown on Map A-5 (in map pocket at back of EIS)) are conceptual and may be

revised in final design. Open water is not a wetland type, but it provides habitat associated with many wetland emergent and submergent plant species and animal species, such as waterfowl and small mammals (i.e., beaver, muskrat, etc.) The wetlands and ponds would be developed to replace habitat types that once existed along the river and would add biological diversity and productivity throughout the river corridor.

3.4.6.3.6 Impact Summary. The Proposed Action would directly impose temporary impacts to 28.2 wetland acres during construction and until the wetlands are fully restored under the SOPs described in Section 1.9.6 of Chapter 1. A total of 80.0 wetland acres (including 24.5 acres of USBR wetlands) would be permanently removed by the construction under the Proposed Action. Specific mitigation for impacts to USBR wetlands is described in Section 3.19.2. There would be a net increase of 207.6 acres of wetland types under the Proposed Action.

About 251 acres of riparian woodland would develop over a 3- to 30-year period on channel banks and covering about half of the new 2-year floodplain. The amount of this acreage that would develop jurisdictional wetland qualities cannot be quantified at this time. However, during the final design phase of the Proposed Action, areas would be designed to facilitate such natural wetland development.

About 14.4 acres of wet meadow would be developed or enhanced by running water through side channels. Construction of wetlands and ponds would create about 12.6 acres of open water and emergent marsh. About 9.6 acres of shrub wetland would develop on channel point bars.

Wet/moist meadow vegetation would be impacted most, while riparian woodland vegetation would benefit most under the Proposed Action. Creation of riparian woodland habitat along the river corridor would result in development of higher rated functions compared with the functions lost from permanent removal of wet/moist meadows that are irrigation-induced wetlands in agricultural fields. Functions that are expected from development of the riparian woodland include: diversity of plant species, including cottonwood overstory, shrub species and herbaceous layer; diverse wildlife habitats, improved aquatic habitat due to shading and diverse bank vegetation; and habitat for threatened, endangered and candidate species (i.e., bald eagle, peregrine falcon, Ute ladies'-tresses and spotted frog).

Tables 3-10, 3-11, and 3-12 summarize short-term construction impacts; permanent wetland impacts from replacing wetlands with project features; and wetland benefits created under the Proposed Action. Table 3-13 summarizes the wetland impacts and benefits under the Proposed Action.

3.4.6.4 Existing Channel Modification Alternative

Existing wetlands would not be impacted by changes in the groundwater table or surface water flow from construction of the Existing Channel Modification Alternative based on results of the hydrology analysis presented in Section 3.2, Water Resources.

A total of 116.8 acres of wet/moist meadow and shrub wetlands would be adversely impacted by equipment operating in wetland areas during construction of the Existing Channel Modification Alternative. Wetland vegetation and soils would be disturbed and removed in the construction corridor, which includes a zone 50 feet wide on each side of the existing channel over 9.6 miles in the Reaches 2 through 9. The 50-foot wide construction corridor is outside the existing dikes where the new setback dikes would be constructed. After completion, these wetland areas would be restored under the SOPs (see Section 1.9.6.1 of Chapter 1) over a 2- to 3-year period. Construction impacts are greater under this alternative than under the Proposed Action because there are more setback dikes constructed and a greater acreage of floodplain grading.

Wetlands would be permanently removed and created under this alternative. About 63.1 acres of wetlands and 1,080 mature cottonwoods would be permanently removed during construction of this alternative. Wetlands that would be removed include wet/moist meadows and riparian woodlands that receive water from a variety of sources, including irrigation ditches, flood irrigation runoff, sub-irrigation, snowmelt runoff, groundwater discharge and the Provo River (see Map A-6 in map pocket at back of EIS for locations of impacted wetland types and areas for each river reach). About 141.9 acres of riparian woodland would be created under this alternative. The benefit-to-impact ratio would be 2 to 1 for wetland benefits to wetland impacts under the Existing Channel Modification Alternative.

Table 3-10 Temporary Direct Adverse Wetland Impacts That Would Occur During Construction of the Proposed Action				
	Wetland Area Adversely Impacted — by Community Type			
Reach	Wet/Moist Meadow (acres)	Emergent Marsh (acres)	Shrub Wetland (acres)	Total Wetlands Impacted (acres)
1	0.0	0.0	0.0	0.0
2	3.3	0.0	0.1	3.4
3	2.0	0.0	1.6	3.6
4	1.4	0.0	0.0	1.4
5	3.1	0.2	0.3	3.6
6	2.8	0.0	0.3	3.1
7	11.1	0.0	0.0	11.1
8	0.3	0.0	0.5	0.8
9	0	0.1	1.1	1.2
Total	**24.0**	**0.3**	**3.9**	**28.2**

Notes:

The temporary wetland impacts shown in this table would be restored under the SOPs after construction is completed.

3.4.6.4.1 Wet/Moist Meadow Complex. A total of 100.9 acres of wet/moist meadow would be adversely impacted during construction of this alternative. Disturbance or removal of vegetation and soils would be a short-term impact during construction and until the areas are restored under the SOPs.

A total of 22.9 acres of wet/moist meadow complex would be eliminated by construction of this alternative. Wetland vegetation and organic wetland soils would be removed, and hydrology would be altered by floodplain grading and placement of fill material in wet/moist meadow areas for construction of new flood dikes. The impact on wet meadow wetland functions under the Existing Channel Modification Alternative would be the same as described for the Proposed Action in Section 3.4.6.3.1

3.4.6.4.2 Riparian Woodland. About 37.6 acres (11.9 percent) of riparian woodland and 1,080 mature cottonwoods would be eliminated by construction of this alternative. Cottonwood, box elder, hawthorns and herbaceous understory vegetation would be eliminated during removal of existing dikes. The impact on riparian woodland functions under the Existing Channel Modification Alternative would be the same as described for the Proposed Action in Section 3.4.6.3.3.

Approximately 141.9 acres of riparian woodland habitat would be created over a 3 to 30-year period under the Existing Channel Modification Alternative for a net increase of 104.3 acres (+33 percent) compared to baseline. The riparian woodland habitat would be created through natural colonization and regeneration, covering the new floodplain between the river and the new setback dikes. Under the operation of Jordanelle Reservoir, the floodplain would be flooded every other year at average flow depths and ranging from 0.1 to 0.5 feet and average velocities ranging from 0.5 to 1.5 feet per second. The assumption was made that these flows would develop soil and hydrology conditions to support natural recruitment of cottonwood and willow species. It would take an estimated 15 to 30 years for cottonwood trees to mature to levels comparable to existing trees, however the vegetation would develop structural diversity much

Table 3-11
Permanent Removal of Wetlands From Construction Under the Proposed Action

Reach	Wetland Area Adversely Impacted — by Community Type						
	WM/MM[a] (acres)	EM[b] (acres)	RW[c] (acres)	Shrub[d] (acres)	USBR[e] WM (acres)	Total Wetlands Impacted (acres)	CW[f] (Number of trees removed)
1	0.0	0.0	0.0	0.0	0.0	0.0	0
2	5.1	0.0	0.2	0.1	0.0	5.4	140
3	3.9	0.0	4.0	0.7	0.0	8.6	79
4	2.7	0.0	0.0	0.3	0.0	3.0	0
5	9.3	0.0	1.0	0.7	0.0	11.0	125
6	2.8	0.7[g]	0.8	0.7	0.0	5.0	335
7	11.2	0.0	0.0	0.2	0.0	11.4	29
8	0.3	0.0	1.2	0.7	10.8	13.0	28
9	0.8	0.1	6.1	0.5	15.1	22.6	237
Total	**36.1**	**0.8**	**13.3**	**3.9**	**25.9**	**80.0**	**973**

Notes:

[a]WM/MM = wet meadow/moist meadow
[b]EM = emergent marsh
[c]RW = riparian woodland
[d]Shrub = shrub wetland
[e]USBR = United States Department of the Interior, Bureau of Reclamation
[f]CW = cottonwood trees.
[g]Includes 0.5 acre open water and 0.2 acre emergent marsh

Table 3-12
Wetlands and Open Water Created Under the Proposed Action

	Wetland Area Created — by Community Type					
Reach	River Bank RW (acres)[a]	Point Bars Shrub[b] (acres)	Emergent Marsh (acres)	Ponds OW (acres)	Side Channels[c] WM (acres)	Total Created Wetlands (acres)
1	0.0	0.0	0.0	0.0	0.0	0.0
2	33.0	0.7	0.5	1.1	2.6	37.9
3	41.7	1.9	0.0	0.0	1.7	45.3
4	43.3	1.3	0.4	0.9	1.5	47.4
5	21.3	0.9	0.5	0.8	1.6	24.3
6	49.9	1.8	1.3	3.5	4.3	60.8
7	17.0	0.9	0.2	0.4	0.8	19.3
8	15.2	0.6	1.4	1.2	1.0	19.4
9	29.6	1.5	0.0	0.4	0.9	32.4
Total	**251.0**	**9.6**	**4.3**	**8.3**	**14.4**	**287.6**

Notes:

WM = wet meadow; RW = riparian woodland; EM = emergent marsh; OW = open water
[a]Riparian woodland habitat created along the banks of new channel alignment = a canopy cover over about one-half of the meander belt width along the length of the new river alignment
[b]Shrub wetlands are assumed to develop on the upper portion of point bars on all inside meanders above the line of inundation.
[c]Side channel area calculation = channel length x 12.5 feet width, which includes a 2.5 foot wide channel and an estimated 5-foot width of enhanced area on each side of the channel

Table 3-13 Summary of Wetland Impacts and Benefits Under the Proposed Action						
Impact Type	Wet/Moist Meadow (acres)	Emergent Marsh (acres)	Open Water (acres)	Riparian Woodland (acres)	Shrub Wetland (acres)	Total (acres)
Temporary direct adverse impacts restored under SOPs	24.0[a]	0.3[a]	0.0	0.0	3.9[a]	**28.2**
Wetlands eliminated[b]	-62.0	-0.3	-0.5	-13.3	-3.9	**-80.0**
Wetlands enhanced under Proposed Action	+14.4	0.0	0.0	0.0	0.0	**+14.4**
Wetlands created under Proposed Action	0.0	+4.3	+8.3	+251.0	+9.6	**+273.2**
[a] **Net change in wetland acres**	**-47.6**	**+4.0**	**+7.8**	**+237.7**	**+5.7**	**+207.6**

Notes:
[a]The acres of direct adverse impacts that would be restored under the SOPs are not included in the calculation to figure net change in wetland acres.
[b]Wetlands would be eliminated incrementally as each reach is constructed.

faster, providing habitat for many species much sooner than the 15 to 30 year period. Wetland functions would develop incrementally as the riparian vegetation becomes established and matures.

3.4.6.4.3 Shrub Wetland. A total of 15.9 acres of shrub wetland would be adversely impacted by disturbance or removal of vegetation and soils during construction of this alternative. The impacts would be short term during construction and until the areas are restored under the SOPs.

A total of 2.6 acres of shrub wetland would be eliminated by construction of this alternative. Willows and other shrub species would be removed, and hydrology would be altered by construction of channel modifications. Wetland functions effected include wildlife habitat diversity and sediment stabilization.

3.4.6.4.4 Impact Summary. Construction of the Existing Channel Modification Alternative would cause direct wetland impacts that include removal of 63.1 acres of wetland vegetation (riparian woodland and wet/moist meadow) and an additional 1,080 mature cottonwood trees. Table 3-14 summarizes, by reach and wetland type, the short-term, adverse construction impacts. Table 3-15 shows the wetland acreage that would be permanently removed under this alternative. About 141.9 acres of riparian woodland would be created over 3 to 30 years in the new floodplain compared to a loss of 37.6 acres of this wetland type. Table 3-16 summarizes the wetland benefits by reach. Table 3-17 summarizes the wetland impacts and benefits under the Existing Channel Modification Alternative.

3.4.6.5 Instream Structures Alternative

Groundwater elevations would not increase under this alternative, therefore no change in existing wetlands would occur.

This alternative would have no measurable beneficial or adverse impacts on wetlands or wetland functions and values because construction would be confined mostly in the present river channel. Minor amounts of shrub and herbaceous bank vegetation would be cleared when necessary to construct the instream structures. SOPs would be implemented to avoid impacts on wetlands and other vegetation. Minor disturbed areas would be revegetated after construction.

Table 3-14
Temporary Direct Adverse Wetland Impacts That Would Occur During Construction Under the Existing Channel Modification Alternative

	Wetland Area Impacted — by Community Type		
Reach	**Wet/Moist Meadow (acres)**	**Shrub Wetland (acres)**	**Total Area (acres)***
1	0.0	0.0	0.0
2	12.6	0.0	12.6
3	17.2	0.0	17.2
4	0.0	15.9	15.9
5	10.2	0.0	10.2
6	20.0	0.0	20.0
7	10.9	0.0	10.9
8	10.6	0.0	10.6
9	19.4	0.0	19.4
Total	**100.9**	**15.9**	**116.8**

Note:
* The impacts have been calculated by multiplying the length of the river (per reach) times 100 feet (50 feet each side of the river). This area makes up the construction corridor that would be impacted during project construction and restored after construction by the SOPs.

Table 3-15
Permanent Removal of Wetlands From Construction Under the Existing Channel Enhancement Alternative

	Wetland Area Adversely Impacted — by Community Type				
Reach	**Wet/Moist Meadow (acres)**	**Riparian Woodland (acres)**	**Shrub Wetland (acres)**	**Total Area (acres)***	**Cottonwood Trees (number lost)**
1	0.0	0.0	0.0	0.0	0.0
2	2.3	8.6	0.0	10.9	140
3	3.8	10.1	0.0	13.9	170
4	0.0	0.0	2.6	2.6	0.0
5	0.0	0.0	0.0	0.0	0.0
6	2.3	1.3	0.0	3.6	135
7	0.9	2.5	0.0	3.4	55
8	9.1	8.7	0.0	17.8	230
9	4.5	6.4	0.0	10.9	350
Total	**22.9**	**37.6**	**2.6**	**63.1**	**1,080**

Note:
* The impacted areas were calculated using maps that show project features related to locations of wetlands identified from wetlands mapping and field investigations.

Table 3-16
Wetlands Created Under the Existing Channel Modification Alternative

Reach	Stream Reach (linear feet)	Area of Floodplain (Riparian Woodland) (acres)
2	5,500	10.0
3	7,510	21.1
4	No dikes*	0.0
5	4,440	13.8
6	8,720	24.9
7	4,730	11.4
8	4,600	36.5
9	8,460	24.2
Total	43,960	**141.9**

Note:
* Reach 4 would have no new riparian woodland and existing riparian woodland would continue at baseline levels.

The riparian woodland area is calculated by multiplying the average width of the floodplain in each reach by the linear feet of stream in the reach.

Table 3-17
Summary of Wetland Impacts and Benefits
Under the Existing Channel Modification Alternative

Impact Type	Wet/Moist Meadow (acres)	Riparian Woodland (acres)	Shrub Wetland (acres)	Total (acres)
Temporary direct adverse impacts restored under SOPs	100.9[a]	0.0	15.9	116.8
Wetlands eliminated	-22.9	-37.6	-2.6	-63.1
Wetlands created under Existing Channel Modification Alternative	0.0	+141.9	0.0	+141.9
Net Change in Wetland Acres[a, c]	**-22.9**	**+104.3**	**-2.6**	**+78.8**

Notes:
[a] The acres of direct adverse impacts that would be restored under the SOPs are not included in the calculation to figure net change in wetland acres.
[b] Wetlands would be eliminated incrementally as each reach is constructed.
[c] Wetlands would be created incrementally over 3 to 30 years after each reach is constructed.

3.4.6.6 No Action Alternative

The annual maintenance of dikes and diversions in and along the Provo River channel would continue under the No Action Alternative. These activities would continue to adversely impact riparian woodland in these areas.

Many existing wetlands along the river corridor are non-jurisdictional and therefore are not regulated or protected under Section 404 of the Clean Water Act. These wetlands are subject to loss from future development, land-use changes, modification of water management practices and deliberate drainage under the No Action Alternative.

3.5 Aquatic Resources

3.5.1 Introduction

The aquatic resources analysis addresses potential impacts on aquatic resources from the construction of the Proposed Action and alternatives. The information and analysis documented in this section was summarized from the Aquatic Resources Technical Report (Mitigation Commission 1997e), which is available from the Mitigation Commission upon request. The focus of the analysis is on game fish and their habitat, non-game fish and their habitat, and other aquatic resources. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.4. The following aquatic resources impact topics are addressed in the impact analysis:

- Game fish (trout) and their habitat
- Non-game fish and their habitat, including potential impacts on aquatic species of special concern
- Other aquatic resources (i.e., amphibians and macroinvertebrates)

3.5.2 Issues Eliminated From Further Analysis

None of the aquatic resources issues raised during scoping and defined in Section 3.5.3 have been eliminated from further analysis.

3.5.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- What opportunities would the project have for developing side channels to benefit fish spawning and rearing?
- What would be the impacts on fish, fish habitat, and other aquatic resources from the PRRP?

3.5.4 Description of Impact Area of Influence

The impact area of influence for evaluating potential impacts of the Provo River Restoration Project (PRRP) on aquatic resources is the Provo River from the outlet of Jordanelle Reservoir downstream to Deer Creek Reservoir. The Provo River was divided into nine stream reaches for describing baseline conditions and potential impacts under the Proposed Action and alternatives. Map 3-1 in Section 3.1.1.1 shows the direct impact area of influence.

3.5.5 Affected Environment (Baseline Conditions)

3.5.5.1 Game Fish and Their Habitat

Three species of game fish were identified during field surveys in the Provo River, including brown trout, rainbow trout and mountain whitefish (see Table 3-18). Most of these game fish species prefer relatively cool water (55 to 62 °F) and live in streams throughout the Intermountain West. Mountain whitefish generally are found in relatively fast but deep runs and pools compared to brown trout, which typically are found in lower-velocity reaches. Rainbow trout are found in a variety of riverine habitats. The following subsections describe the game fish present in the impact area of influence, baseline habitat quality attribute ratings, and baseline predicted trout standing crop.

3.5.5.1.1 Game Fish Occurrence Under Existing Conditions. The following paragraphs describe the occurrence of game fish in the Provo

Table 3-18
Fish Species Collected in Provo River and Nearby Heber Valley Streams

Common Name	Scientific Name	Location: Provo River[1]	Location: Heber Valley Streams[2]	Game (G) or Non-Game (NG)
Brown Trout	*Salmo trutta*	X	X	G
Rainbow Trout	*Oncorhynchus mykiss*	X	X	G
Mountain Whitefish	*Prosopium williamsoni*	X	X	G
Leatherside Chub	*Gila copei*	X	X	NG
Longnose Dace	*Rhinichthys cataractae*	X	X	NG
Speckled Dace	*Rhinichthys osculus*		X	NG
Redside Shiner	*Richardsonius balteatus*	X	X	NG
Mountain Sucker	*Catostomus platyrhynchus*	X	X	NG
Utah Sucker	*Catostomus ardens*	X	X	NG
Mottled Sculpin	*Cottus bairdi*	X	X	NG

Notes:
Source: CUWCD 1993a, Utah Division of Wildlife Resources (1984, 1985, 1986)
[1]Provo River from Jordanelle Dam downstream to Deer Creek Reservoir
[2]Heber Valley streams; tributaries of Provo River in the Project Area

River based on July 1993 field surveys. These surveys represent existing conditions prior to the establishment of 125 cfs minimum instream flow under baseline conditions and are appropriate as a general indication of game fish occurrence in the Provo River.

Brown trout were the predominant game fish collected during the surveys and were present in each stream reach sampled. Rainbow trout were the next most abundant game fish species, though at considerably lower numbers compared to brown trout. Most rainbow trout were collected from the lowest reach of the Provo River just upstream from Deer Creek Reservoir. Mountain whitefish were collected throughout the Provo River.

3.5.5.1.2 Baseline Habitat Quality Attribute Ratings. The Binns HQI Model II baseline habitat attribute ratings (described in Section B.2.4.2.1 of Appendix B) were developed during field surveys and include quantitative measurements as well as best professional judgment. The overall results of the baseline ratings are presented in Table 3-19. The ratings represent the quality of nine different aspects of trout habitat.

Late summer stream flow was assigned an optimal rating in all reaches to account for the 125 cfs minimum instream flow under baseline conditions. Annual stream flow variation was assigned a rating of 3 in all reaches because only small fluctuations (the ratio of the annual peak flow to the annual low flow was between 16 and 39) in flow are expected since the 125 cfs minimum flow requirement has been implemented. Maximum summer temperature and nitrate nitrogen habitat ratings were based on results of water quality modeling for baseline conditions (see Section 3.3, Water Quality). Fish cover was rated low throughout all reaches because of lack of any improvements to the channel under baseline conditions. Eroding stream banks were generally not considered to be a limiting factor and received optimal ratings in all reaches except Reach 9. Submerged aquatic vegetation was rated low in most reaches because of low nutrient inputs and lack of channel structure. Current velocity was rated low in most reaches because of observed high flow velocity problems that would not be improved under baseline conditions. Wetted channel width was rated low in most reaches.

3.5.5.1.3 Baseline Predicted Trout Standing Crop and Biomass. Table 3-20 shows the baseline

Table 3-19
Baseline Habitat Attribute Ratings and Predicted Trout Standing Crop for Provo River

Stream Reach	Baseline Habitat Attribute Ratings[1]									Baseline Predicted Trout Standing Crop[2] (lb/acre)
	X1	X2	X3	X4	X7	X8	X9	X10	X11	
1	4	3	4	1	1	4	1	3	2	**83.6**
2	4	3	4	1	1	4	1	2	2	**66.1**
3	4	3	3	1	1	4	1	2	2	**42.5**
4	4	3	4	1	1	4	1	2	2	**66.1**
5	4	3	4	1	1	4	1	2	2	**66.1**
6	4	3	4	1	1	4	1	2	2	**66.1**
7	4	3	3	1	1	4	2	2	2	**63.3**
8	4	3	3	1	1	4	1	2	2	**42.5**
9	4	3	3	1	1	4	1	2	1	**36.5**

Notes:

[1]Habitat Attribute Ratings (ratings range from 0 [worst] to 4 [best], see Section B.2.4.2.1 in Appendix B for description):

X1-Late summer stream flow
X2-Annual stream flow variation
X3-Maximum summer stream temperature
X4-Nitrate-nitrogen
X7-Fish cover
X8-Eroding stream banks
X9-Submerged aquatic vegetation
X10-Current velocity
X11-Wetted channel width

[2]Predicted trout standing crop is the total weight of trout per unit area of water as calculated by the Binns HQI Model II (see Appendix B, Section B.2.4.2.1 for description).

Table 3-20
Summary of Baseline Habitat Quantity, Predicted Trout Standing Crop and Trout Biomass

Reach	Reach Length (feet)	Average Width (feet)	Surface Area (acres)	Predicted Trout Standing Crop (pounds/acre)	Trout Biomass* (pounds)
1	3,400	63	4.9	84	410
2	5,500	70	8.8	66	582
3	7,510	61	10.5	43	446
4	6,920	78	12.4	66	820
5	4,440	63	6.4	66	422
6	8,720	88	17.6	66	1163
7	4,730	83	9.0	63	570
8	4,600	70	7.4	43	315
9	8,460	73	14.2	37	518
Totals	**54,280**		**91.2**		**5,246**

Note:

*Surface area (acres) x predicted trout standing crop (pounds/acre) = trout biomass (pounds) = the total weight of trout in the river reach

conditions for habitat quantity, baseline predicted trout standing crop and baseline predicted trout biomass in the impact area of influence. See Section 1.4 of Chapter 1 and Section 3.1.2 of this EIS for an explanation of the difference between existing conditions and baseline conditions. Baseline habitat quality attribute ratings were assigned using best professional judgment of the likely effects from providing 125 cfs minimum instream flow and, where available, quantitative data. See Appendix B Section B.2.4.2.1 for a description of this process.

3.5.5.2 Non-Game Fish and Their Habitat

Seven non-game fish species were identified from the field surveys in the Provo River and its tributaries, including longnose dace, speckled dace, redside shiner, mountain sucker, mottled sculpin, Utah sucker and leatherside chub (see Table 3-18). The following describes the general occurrence of each non-game fish species based on field surveys during 1993, before establishing 125 cfs instream flow under baseline conditions.

Longnose dace, redside shiner, mountain sucker, and mottled sculpin were the most common non-game fish collected in the Provo River. Leatherside chub is a species with special status. Fourteen leatherside chub were collected in the Provo River. Leatherside chub are medium-sized minnows, seldom exceeding 6 inches in length, that live about 8 years. Leatherside chub are listed as species of special concern by the Utah Division of Wildlife Resources. Leatherside chub has a rank of SO — has experienced a substantial decrease in population, distribution and/or habitat availability — in the Utah Sensitive Species List (Utah Division of Wildlife Resources 1997). The reasons for the decline of the leatherside chub are not well understood, but likely include dewatering of streams, predation from introduced species and changes in water quality due to human influences (Shirley 1989 and 1993, Holden et al. 1994).

Very little is known about the habitat preferences of the leatherside chub, however, the historic distribution of this species suggests a "cool" water preference. Based on collections by Woodward-Clyde Consultants (CUWCD 1993a) during Heber Valley field surveys, they are usually found in areas characterized by cobble/gravel substrates, low to medium velocity, warm late-summer temperatures and some turbidity. It is

unclear whether the chub prefer this type of habitat or are driven there by competition or predation by trout and other cold-water species.

Baseline estimates of non-game fish standing crop or biomass were not prepared. Length and weight data for non-game fish were collected and are described in the Aquatic Resources Technical Report (Mitigation Commission 1997e). The Binns HQI Model II methodology was developed specifically to estimate trout production and is not appropriate to use with data for other types of fish.

3.5.5.3 Other Aquatic Resources

Other aquatic resources include benthic macroinvertebrates (aquatic insects) and amphibians (frogs, salamanders). Surveys along the Provo River were not conducted for either of these groups except for the spotted frog, which is a candidate threatened and endangered species (see Section 3.7, Threatened and Endangered Species). A candidate is a species determined to warrant consideration to be proposed for listing in the Federal Register under the Endangered Species Act (ESA). A Conservation Agreement is being developed by resource agencies in Utah to remove and/or eliminate threats that would warrant listing the spotted frog as a threatened or endangered species.

Benthic macroinvertebrates are an important component of the aquatic ecosystem. They help process organic matter, cycle nutrients, and provide a source of food for both game and non-game fish species. The habitat attribute rating for submerged aquatic vegetation is an estimate of the expected density of aquatic macroinvertebrates. This attribute was assigned ratings of 1 for all Provo River stream reaches except for a 2 rating at PR-03 (Reach 7). This indicates that macroinvertebrate abundance is only fair in these streams, with expected aquatic macroinvertebrate densities ranging from 25 to 99 per square foot. A rating of 2 indicates moderate macroinvertebrate density (100 to 249 macroinvertebrates per square foot).

There is no specific or quantitative information on the presence or abundance of amphibians in the Project Area except for the spotted frog. Several amphibian species are reported as year-round residents of the Project Area, including the spotted frog, Woodhouse toad, leopard frog, boreal chorus frog, and tiger salamander. All amphibian species are associated with pond, emergent marsh and stream riparian habitats.

3.5.6 Impact Analysis

3.5.6.1 Significance Criteria

The aquatic resources significance criteria are based on the Binns HQI Model II results, professional judgment and contacts with state and federal wildlife officials. The following types of impacts on aquatic resources and their habitat would be considered significant:

- Impacts on game fish and their habitat resulting from instream construction activities that occur within any spawning areas or cause sedimentation in any spawning areas
- A decrease in the Binns HQI Model II habitat attribute ratings compared to baseline conditions within the impact area of influence
- A decrease in the Binns HQI Model II predicted trout standing crop compared to baseline conditions within the impact area of influence

Although the Binns HQI Model II standing crop predictions apply specifically to trout, the habitat attribute ratings also apply generally to non-game fish and other aquatic resources. The habitat attribute results were used to qualitatively assess the significance of potential impacts on non-game fish and other aquatic resources.

3.5.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential aquatic resources impacts have been eliminated from further analysis.

3.5.6.3 Proposed Action (Riverine Habitat Restoration)

The following subsections define potential aquatic resources impacts during the construction and operation phases of the Proposed Action.

3.5.6.3.1 Game Fish and Their Habitat

3.5.6.3.1.1 Impacts During Construction. Construction of the Proposed Action would cause short-term soil erosion of the Provo River stream bottom and bank resulting in increased turbidity during the construction period. This would lead to increased sediment deposition and associated nutrient concentrations in the Provo River in the area immediately downstream from the construction activity, which could potentially impact game fish and their habitat. Typical construction procedures are described in Section 1.5.4 of this EIS. The use of cofferdams, sediment control measures, constructing in-channel features during dry or low-flow periods, and a sequential construction schedule would likely limit the extent of turbidity impacts to the area of the reach where construction is underway.

SOPs for Aquatic resources, revegetation and erosion would be implemented to minimize potential adverse impacts caused by turbidity and sediment deposition during construction (see Section 1.9.6.1 of Chapter 1). As determined by the soil analysis described in Section 3.8, Soil Resources, these SOPs would control erosion near stream corridors and minimize the risk of siltation of stream channels during construction. Therefore, the introduction of sediments into the Provo River from construction would be minimal and probably not measurably different than baseline conditions. Similarly, associated increases in nutrient concentrations would be so small compared to baseline conditions that they likely could not be measured, and there would be no significant impacts on game fish and their habitat.

Temporary impacts on game-fish spawning areas would occur during construction of the Proposed Action. These impacts would occur during construction when spawning areas would be lost as water is diverted into a newly-constructed reach and the former river channel becomes dry. The impact would be temporary because the newly-constructed reach would replace the spawning habitat lost in the former reach. Loss of game-fish species could occur if developing eggs were present in the gravel during construction, and if fish were stranded in the reach as it is dewatered. However, the phased construction of the Proposed Action will reduce the amount of spawning area that is removed at any one time. In addition, SOPs for aquatic resources will avoid impacts on game-fish spawning areas by reducing access by resident fish to areas being constructed and moving any stranded fish from dewatered areas. Overall, there would be no significant impacts on game-fish spawning areas because there would be no permanent removal of any spawning areas.

Water temperature would temporarily increase during construction of the Proposed Action because of removal of riparian vegetation that now shades portions of the existing channel. The estimated increase in maximum summer stream temperature ranges from 1.2°F in Reach 5 to 6.2°F in Reach 8. It would take an estimated 10 to 30 years after construction for shading in revegetated areas to reach levels comparable to baseline conditions. These temperature increases would not be significant based on the habitat attribute criteria for maximum summer stream temperature. For all reaches, the estimated increase in temperature was within the range of an optimal rating for maximum summer stream temperature, according to the methodology used for the Binns HQI Model II. Therefore, there would be no short- or long-term adverse impacts on game fish and their habitat.

3.5.6.3.1.2 Impacts After Construction. After construction the Proposed Action would result in changes in physical habitat characteristics, habitat quality attributes, and predicted trout standing crop in the Provo River. The following are descriptions of these changes.

Physical Habitat Characteristics. Table 3-21 shows the projected changes from baseline conditions in Provo River physical habitat characteristics under the Proposed Action based on results described in an engineering analysis of alternatives for the Provo River Restoration Project (CUWCD 1994). The length of the Provo River would increase by 9,430 feet while the surface area of aquatic habitat would increase by 13.8 acres under the Proposed Action. This would have a positive impact on game-fish and their habitat in the impact area of influence.

Side channels, wetlands and ponds could be developed under the Proposed Action on both sides of the new river alignment in Reaches 2 through 9. No side channels would be constructed in Reach 1. About 50,070 feet (9.5 miles) of side channels would be developed in the Core Area and Expanded Restoration Area (see Section 1.3.2 in this EIS). The side channels and ponds would provide additional rearing habitat for juvenile game fish and

Table 3-21 Summary of Changes in Provo River Physical Habitat Characteristics From Baseline Conditions Under the Proposed Action						
	Reach Length			Stream Surface Area		
Reach	Baseline (feet)	Proposed Action (feet)	Change From Baseline (feet)	Baseline (acres)	Proposed Action (acres)	Change From Baseline (acres)
1	3,400	3,400	0.0	4.9	4.9	0.0
2	5,500	6,500	1,000	8.8	10.9	2.1
3	7,510	8,390	880	10.5	13.9	3.4
4	6,920	6,850	(-70)	12.4	11.4	(-1.0)
5	4,440	5,770	1,330	6.4	9.4	3.0
6	8,720	10,770	2,050	17.6	17.8	0.2
7	4,730	6,100	1,370	9.0	10.0	1.0
8	4,600	5,500	900	7.4	9.2	1.8
9	8,460	10,430	1,970	14.2	17.5	3.3
Totals	**54,280**	**63,710**	**9,430**	**91.2**	**105.0**	**13.8**

habitat for non-game species that prefer streams with lower velocities. Some wetlands and ponds would be constructed in the side channels, but others would be constructed to collect hyporheic groundwater fed by the river. This would reduce the likelihood of predaceous fishes entering the ponds, and would reduce the potential for predation on spotted frogs.

The changes in physical habitat characteristics of the Provo River described in this section for the Proposed Action generally would result in significant positive impacts on habitat for game fish and aquatic resources. The proposed changes would provide a dynamically stable, functioning stream that would allow development of optimal habitat conditions over time. This statement is based on results of case studies in stream restoration for Bear Valley Creek in central Idaho and the East Fork Sevier River in south central Utah. A more detailed discussion of these results is contained in the Appendix to the Aquatic Resources Technical Report (Mitigation Commission 1997e).

In the case of Bear Valley Creek, although the general trend of the case study physical habitat monitoring showed improved conditions over time, there was considerable year-to-year variability. Following construction, the recovery process of the case study streams to stable, improved habitat conditions included both increases and decreases in one or more attributes. It was not a smooth, uniform process. Effects from a prolonged drought likely contributed to the up and down variability in habitat attributes. This type of variability in development of physical habitat characteristics following construction may also occur in the Provo River under the Proposed Action. As with the case study streams, the important consideration is that the general trend over time would be toward improved conditions and overall stability of the physical habitat and increased base-level food production that is developed over time. For this reason, the analysis of the Proposed Action has predicted increases in habitat would continue to increase over a 5 to 15 year period.

Habitat Quality Attributes. In general, analysis of the Proposed Action resulted in optimal, or nearly optimal, ratings for most habitat attributes compared to baseline ratings. Late summer stream flow was rated optimal under baseline conditions and did not change as a result of the Proposed Action. In addition, the attribute ratings for nitrate-nitrogen and eroding stream banks were unchanged from baseline conditions. Very little bank erosion occurs under baseline conditions because of the presence of dikes and riprap levees. Under the Proposed Action, erosion would be low because of bank stability enhanced by vegetated stream banks.

Maximum summer stream temperature, fish cover, and submerged aquatic vegetation attributes were rated optimal or nearly optimal. This was based on water quality modeling of the Proposed Action (see Section 3.3, Water Quality) and monitoring results from case studies that documented improvements in stream temperature, fish cover and submerged aquatic vegetation over time.

Current velocity was rated optimum in all reaches as a result of design parameters included under the Proposed Action, average monthly flows reported in the water resources analysis (see Section 3.2, Water Resources), and typical channel cross-sectional area. This rating also was supported by results from the Bear Valley Creek restoration case study, which showed lower current velocities throughout the restored reach.

Wetted channel width was rated 3 in all reaches, except Reach 1, as a result of design parameters included in the Proposed Action. Reach 1 was unchanged from baseline conditions.

Predicted Trout Standing Crop. The habitat quality attribute ratings described in the previous paragraphs would lead to improved aquatic habitat quality and result in an increase in the predicted trout standing crop. Table 3-22 shows predicted trout standing crop and biomass in Reaches 1 through 9 under the Proposed Action, and changes in these estimates from baseline conditions. All reaches would experience an increase in predicted trout standing crop and biomass. The predicted increases do not include increases from additional habitat provided by development of side channels and ponds, which was not quantified, but would be an overall positive impact.

The overall increase in predicted trout standing crop under the Proposed Action ranges from zero to 263 pounds/acre (see Table 3-22). Predicted trout biomass would increase by 25,212 pounds (481 percent) under the Proposed Action. This increase in predicted trout standing crop and trout biomass over baseline conditions would be a positive impact resulting from the Proposed Action. It would take an estimated 5 to 15 years to reach the full potential of trout production as a result of the improvements in habitat quality. Management of the Provo River within the impact area of influence for natural production, with no supplementation from hatchery sources, would require several years of successful trout reproduction and recruitment to reach the predicted production levels. The Final EIS for the nearby Strawberry Valley Management Area estimated that it will take 15 to 20 years for natural trout production to reach full potential in the upper Strawberry River basin after eliminating the transbasin diversion (USFS 1990).

The increase in predicted trout standing crop under the Proposed Action is supported by monitoring results for the stream restoration case studies. At Bear Valley Creek in central Idaho, results of fish density monitoring varied considerably over time despite a general upward trend. This project is located on upper Bear Valley Creek, Idaho, in the headwaters region of the Middle Fork of the Salmon River. General hydrologic conditions of the drainage basin are similar to those in the Provo River basin. Following construction, annual monitoring surveys were conducted from 1987 through 1990, and again in 1993. The system had stabilized over the period of the monitoring. One trend that was evident in Bear Valley Creek post-restoration monitoring was increased population density over time for young-of-the-year, juvenile and resident trout species. The restored reach also had greater relative increases in fish population density than control areas upstream and downstream of the restored reach. The species monitored in Bear Valley Creek included steelhead/rainbow trout hybrids, cutthroat trout, brook trout and mountain whitefish.

The East Fork of the Sevier River is located in Garfield County in south central Utah. The river originates in the forested headwaters of the Dixie National Forest located north of Bryce Canyon National Park, and flows south to its confluence with the Sevier River at Junction, Utah. The mean summer daily flow is 21.9 cfs and the mean annual daily flow is 25.8 cfs. At the East Fork Sevier River, available fish monitoring data only covered three years after restoration. Results for brown and cutthroat trout showed slight declines in population densities one year following restoration, but significant increases after three years compared to pre-restoration. Over this three-year period, trout biomass increased 460 percent in the restored reach. Although the information only covers three years, it is an important illustration of the anticipated level of effects on resident fish in the Provo River following construction of the Proposed Action.

Variability in fish standing crop and biomass also would be expected in the Provo River following

Table 3-22
Summary of Impacts on Trout Standing Crop and Biomass Under the Proposed Action (Riverine Habitat Restoration)

Reach	Predicted Trout Standing Crop[1]				Predicted Trout Biomass[2,3]			
	Baseline (lb/acre)	Proposed Action (lb/acre)	Change from Baseline (lb/acre)	Percent Change from Baseline (%)	Baseline (pounds)	Proposed Action (pounds)	Change from Baseline (pounds)	Percent Change from Baseline (%)
1	84	84	0	0	410	410	0	0
2	66	300	234	355	582	3272	2690	462
3	43	300	257	598	446	4173	3727	836
4	66	300	234	355	820	3423	2603	317
5	43	300	257	598	422	2822	2399	568
6	43	300	257	598	1163	5344	4180	359
7	63	300	237	376	570	3000	2430	426
8	43	300	257	598	315	2760	2445	776
9	37	300	263	711	518	5254	4736	914
Totals	**n/a[4]**	**n/a**	**n/a**	**n/a**	**5,246**	**30,458**	**25,212**	**481**

Notes:

[1]Predicted Trout Standing Crop is the modeled living mass of trout per unit area of water.
[2]Predicted Trout Biomass is the modeled living mass of trout in the stream reach.
[3]Predicted trout biomass was determined by multiplying the surface area (acres) of habitat created in a reach by the predicted trout standing crop (pounds/acre) in that reach.
[4]n/a = not applicable
[5]Predicted Trout Standing Crop and Predicted Trout Biomass in Table 3-22 do not include expected increases associated with side channels.

development of a new river channel under the Proposed Action. The variability would likely be relatively high during the first few years and gradually decrease as physical conditions stabilize and habitat features develop. The stream restoration case studies showed that improvements in habitat result in improvement in fish populations, but the improvement takes several years and varies considerably year-to-year.

3.5.6.3.2 Non-Game Fish and Their Habitat

3.5.6.3.2.1 Impacts During Construction. Potential impacts of construction on non-game fish and their habitat would be the same as described in Section 3.5.6.3.1.1 for game fish.

3.5.6.3.2.2 Impacts After Construction. Potential impacts after construction of the Proposed Action would include changes in physical habitat characteristics, habitat quality attributes, and potential changes in standing crop of non-game fish. The following are descriptions of these changes:

Physical Habitat Characteristics. The Proposed Action would result in increased aquatic habitat surface area and channel complexity within the main channel of the Provo River. Construction of a riffle-pool channel sequence would produce a similar level of benefit to most non-game fish species as described for game fish species. Habitat quality may decrease slightly for some non-game species, such as the leatherside chub, which prefer relatively warmer, slower-moving water compared to game fish. Most of this decrease would be caused by the change from existing conditions to the provision of 125 cfs minimum instream flow under baseline conditions for this EIS. The increase in aquatic habitat surface area and complexity over baseline conditions would be a positive impact on non-game fish and their habitat.

Development of side channels and ponds under the Proposed Action would benefit non-game species, which prefer slower current velocities, relatively warmer temperatures and increased habitat complexity. Development of these features would have a positive impact on non-game fish and their habitat. The Mitigation Commission has initiated a data collection effort to identify microhabitat utilization by leatherside chub as a conservation measure for this species. This information would be integrated into final design of side channels and main channel features of the Proposed Action.

Habitat Quality Attributes. Most of the ratings for habitat quality attributes would improve for game fish and their habitat compared to baseline conditions. In general, the improvements in habitat conditions for game fish associated with the Proposed Action would not result in a decrease in habitat quality for non-game fish. Most of the non-game fish found in the Provo River are widely distributed throughout streams in the Intermountain West and co-exist with game fish throughout their range. Several changes in habitat attributes from baseline conditions, reflecting optimal conditions for game fish, would either benefit or have no effect on non-game fish. These are described below.

The increase in maximum summer stream temperature described for game fish species would have no effect on non-game fish. In general, most non-game fish found in the Provo River tolerate a higher range of water temperatures compared to game fish.

An increase in fish cover (X7 in the Baseline Habitat Quality Attribute Ratings) would benefit non-game fish. Fish cover includes places of refuge such as instream structures, overhanging vegetation, or undercut banks. Under the Proposed Action, construction of side channels would provide additional cover that would benefit non-game species by providing additional habitat complexity.

An increase in submerged aquatic vegetation (X9) would increase macroinvertebrate density, a food source that would benefit non-game fish.

A reduction in baseline current velocity (X10) would benefit non-game fish. The stream gradient and riffle-pool sequence that would be constructed under the Proposed Action would reduce baseline current velocities.

Predicted Standing Crop. The Binns Habitat Quality Index (HQI) Model II was developed to predict standing crop of trout populations and is not appropriate for quantitative estimations of potential changes in the standing crop of non-game fish. However, it is likely that improvements in stream habitat conditions under the Proposed Action would also result in an increase in the standing crop of non-game fish species.

3.5.6.3.3 Other Aquatic Resources

3.5.6.3.3.1 Impacts During Construction. The Proposed Action would not result in any significant impacts during construction to other aquatic resources for the same reasons described in Section 3.5.6.3.1.1 for game fish species and their habitat.

3.5.6.3.3.2 Impacts After Construction. Potential impacts after construction of the Proposed Action would be the same as described in Section 3.5.6.3.2.2 for non-game fish and their habitat. Overall, improved physical characteristics of the Provo River Project Area and improved habitat quality attributes would result in a positive impact on other aquatic resources.

3.5.6.3.4 Impact Summary. There would be a short-term loss of available habitat and a potential degradation of water quality during construction. However, the potential water quality-related impacts (increased sediment deposition, increased nutrient concentrations, and an increase in maximum summer stream temperatures until vegetation is re-established) would not be significant or adverse.

Improvements in aquatic resources habitat from the channel and side-channel development features of the Proposed Action would result in positive impacts. Trout biomass would increase over baseline conditions. Total trout biomass over all reaches would increase an estimated 25,212 pounds (or 481 percent) over baseline conditions. It would take about 5 to 15 years for trout production to reach the full potential predicted under the Proposed Action. The increase in predicted trout standing crop and biomass would be a positive impact of the Proposed Action.

A total of 105.0 acres of aquatic habitat surface area would be developed within the restored, natural river channel under the Proposed Action compared to 91.2 acres under baseline conditions, resulting in an increase of 13.8 acres (or 15 percent) in aquatic habitat surface area compared to baseline conditions. The Proposed Action would also include side channels, wetlands and ponds adjacent to the main river channel, which would provide additional aquatic habitat surface area outside the main river channel. This would result in an increase in the diversity of aquatic habitat types as well as surface area of habitat types, which would be a positive impact of the Proposed Action.

3.5.6.4 Existing Channel Modification Alternative

3.5.6.4.1 Game Fish and Their Habitat

3.5.6.4.1.1 Impacts During Construction. Construction of the Existing Channel Modification Alternative may cause short-term soil erosion during construction. This would lead to increased sediment deposition and associated increased nutrient concentrations in the Provo River which may cause a short-term impact on game fish and their habitat. However, the soil analysis (Section 3.8, Soil Resources) concludes that the construction activities only would cause negligible amounts of soil to enter the Provo River. Therefore, potential impacts on game fish spawning areas from sedimentation and increases in nutrient concentrations would not be significant.

Water temperatures would increase slightly under the Existing Channel Modification Alternative, generally the result of removing existing riparian vegetation that shades portions of the existing channel. It would take an estimated 15 to 30 years after construction for revegetated areas to reach shading levels comparable to baseline conditions. The estimated increase in maximum summer stream temperature ranges from no increase in Reaches 4 and 5 to a 5.4°F increase in Reach 8. Based on the habitat attribute criteria for maximum summer stream temperature these increases would still result in temperature-related ratings of 4 (optimal) for all stream reaches. No temperature-related impacts on game fish and their habitat would result.

3.5.6.4.1.2 Impacts After Construction. After construction, this alternative would result in changes in physical habitat characteristics, habitat quality attributes and predicted trout standing crop in the Provo River. Following are descriptions of these changes.

Physical Habitat Characteristics. Table 3-23 shows the reach length and surface area that would be developed under the Existing Channel Modification Alternative compared to baseline conditions. This alternative would not change the length of the Provo River. The surface area of aquatic habitat under the Existing Channel Modification Alternative would be 73.3 acres compared to 91.2 acres under baseline conditions. This would be a decrease of 17.9 acres (or 20

Table 3-23
Summary of Changes in Provo River Physical Habitat Characteristics from Baseline Conditions Under the Existing Channel Modification Alternative

	Reach Length			Stream Surface Area		
Reach	Baseline (feet)	Existing Channel Modification Alternative (feet)	Change From Baseline (feet)	Baseline (acres)	Existing Channel Modification Alternative (acres)	Change From Baseline (acres)
1	3,400	3,400	0.0	4.9	4.9	0.0
2	5,500	5,500	0.0	8.8	8.3	-0.5
3	7,510	7,510	0.0	10.5	11.4	0.9
4	6,920	6,920	0.0	12.4	10.3	-2.1
5	4,440	4,440	0.0	6.4	5.1	-1.3
6	8,720	8,720	0.0	17.6	10.0	-7.6
7	4,730	4,730	0.0	9.0	5.4	-3.6
8	4,600	4,600	0.0	7.4	5.3	-2.1
9	8,460	8,460	0.0	14.2	12.6	-1.6
Totals	**54,280**	**54,280**	**0.0**	**91.2**	**73.3**	**-17.9**

Note:
Data from CUWCD (1994)

percent) in aquatic habitat surface area compared to baseline conditions. This is a result of a low flow channel configuration that would be relatively narrower and deeper than under baseline conditions, thus reducing the overall surface area. The low flow channel would provide greater water depth at low flow compared to baseline conditions, resulting in improved aquatic habitat even though the surface area is less than baseline conditions. There would be no significant impacts on game fish or their habitat as a result of the loss of surface area from the development of a low flow channel under this alternative.

Habitat Quality Attributes. In general, most habitat attribute ratings would increase compared to baseline ratings. No changes were made in the baseline ratings in Reach 1 because the Existing Channel Modification Alternative does not include any improvements in that reach. The habitat attribute for maximum summer stream temperature is rated 4 (optimal) in all reaches, based on the water quality modeling results by reach and habitat attribute criteria. Nitrate-nitrogen levels would be unchanged from baseline conditions for the same reasons described in Section 3.5.6.3.1.2 for the Proposed Action.

The habitat attribute ratings for fish cover, submerged aquatic vegetation, current velocity and wetted channel width were generally scored one to two ratings higher than the corresponding baseline ratings (i.e., they were rated 2 or 3 versus 1 under baseline). These ratings were based on predicted improvements in the related habitat attributes that would result from physical improvements to channel morphology and instream structure under the Existing Channel Modification Alternative.

Predicted Trout Standing Crop. The habitat quality attribute ratings described in this section would lead to improved aquatic habitat quality and result in an increase in the predicted trout standing crop. Table 3-24 shows predicted trout standing crop and biomass in Reaches 1 through 9 under the Existing Channel Modification Alternative and changes in these estimates from baseline conditions.

All reaches would experience an increase in predicted trout standing crop and biomass. The increase in predicted trout standing crop under the

Table 3-24
Summary of Impacts on Trout Standing Crop and Biomass Under the Existing Channel Modification Alternative

Reach	Predicted Trout Standing Crop[1]				Predicted Trout Biomass[2,3]			
	Baseline (lb/acre)	Existing Channel Mod. Alt. (lb/acre)	Change from Baseline (lb/acre)	Percent Change from Baseline (%)	Baseline (pounds)	Existing Channel Mod. Alt. (pounds)	Change from Baseline (pounds)	Percent Change from Baseline (%)
1	84	84	0	0	410	410	0	0
2	66	186	120	182	582	1546	964	166
3	43	186	143	333	446	2123	1677	376
4	66	186	120	182	820	1918	1098	134
5	66	186	120	182	422	950	527	43
6	66	186	120	182	1163	1863	700	60
7	63	186	123	195	570	1006	436	76
8	43	186	143	333	315	987	673	100
9	37	186	149	403	518	2347	1829	316
Totals	**n/a[4]**	**n/a**	**n/a**	**n/a**	**5,246**	**13,150**	**7,904**	**151**

Notes:

[1]Predicted Trout Standing Crop is the modeled living mass of trout per unit area of water.
[2]Predicted Trout Biomass is the modeled living mass of trout in the stream reach.
[3]Predicted trout biomass was determined by multiplying the surface area (acres) of habitat created in a reach by the predicted trout standing crop (pounds/acre) in that reach.
[4]n/a = not applicable

Existing Channel Modification Alternative ranges from zero to 149.8 pounds per acre (see Table 3-24). Overall predicted trout biomass would increase by 7,904 pounds (or 151 percent compared to baseline conditions. This increase in predicted trout standing crop and trout biomass over baseline conditions is a positive impact resulting from the Existing Channel Modification Alternative. It would take about 5 to 20 years for trout production to reach the full potential as a result of improvements in habitat quality. Management of the Provo River within the impact area of influence for natural production, with no supplementation from hatchery sources, would require a number of years of successful trout reproduction and recruitment to reach the predicted production levels. The Final EIS for the nearby Strawberry Valley Management Area estimated that it will take 15 to 20 years for natural trout production to reach full potential in the upper Strawberry River basin after eliminating the transbasin diversion (USFS 1990).

3.5.6.4.2 Non-Game Fish and Their Habitat

3.5.6.4.2.1 Impacts During Construction. Potential impacts of construction on non-game fish and their habitat are the same as described in Section 3.5.6.4.1.1 for game fish.

3.5.6.4.2.2 Impacts After Construction. Potential impacts after construction of the Existing Channel Modification alternative include changes in physical habitat characteristics, habitat quality attributes, and potential changes in standing crop of non game fish. Following are descriptions of these changes.

Physical Habitat Characteristics. The physical habitat characteristics of the Existing Channel Modification Alternative are described in Section 3.5.6.4.1.2. An increase in channel complexity and construction of a step-pool channel sequence would result in benefits to non-game fish species compared to baseline conditions. Side channels would not be constructed under the Existing Channel Modification alternative.

Habitat Quality Attributes. The predicted changes in habitat attribute ratings under the Existing Channel Modification Alternative were described in Section 3.5.6.4.1.2. As previously stated, most of the ratings increase compared to baseline conditions. In general, the improvements in habitat conditions for game fish associated with this alternative would also result in an increase in habitat quality for non-game fish.

Predicted Standing Crop. The Binns HQI Model II was developed to predict standing crop of trout populations and is not appropriate for quantitative estimates of potential changes in non-game fish standing crop. However, it is likely that improvements in stream habitat under the Existing Channel Modification Alternative would result in an increase in the standing crop of non-game fish species.

3.5.6.4.3 Other Aquatic Resources

3.5.6.4.3.1 Impacts During Construction. Construction of the Existing Channel Modification Alternative would not result in any significant impacts to other aquatic resources for the same reasons described in Section 3.5.6.4.1.1 for game fish species and their habitat.

3.5.6.4.3.2 Impacts After Construction. Potential impacts after construction of the Existing Channel Modification Alternative would be the same as described in Section 3.5.6.4.2.2 for non-game fish and their habitat. Overall, improved physical characteristics of the Provo River and improved habitat quality attributes would have a positive impact on other aquatic resources.

3.5.6.4.4 Impact Summary. There would be a short-term loss of available habitat and potential water quality degradation during construction. Water quality-related impacts would include increased sediment deposition, increased nutrient concentrations, and an increase in maximum summer stream temperature. However, these impacts would not be significant.

The total length of the Provo River would not change under this alternative. Aquatic habitat surface area would be 73.3 acres (see Table 3-23) compared to 91.2 acres under baseline conditions. This would be a decrease of 17.9 acres (or 20 percent) in surface area compared to baseline conditions. No side channels would be developed under this alternative.

Operation of this alternative would have positive impacts on game fish and their habitat. Predicted trout standing crop would increase over baseline conditions. The increase would range from zero to 149 pounds per acre compared to baseline

conditions. Trout biomass would increase over baseline conditions by 7,904 pounds (or 151 percent). This would be a positive impact of this alternative.

Positive impacts on non-game fish and their habitat and other aquatic resources would generally be the same as described for game fish and their habitat in Section 3.5.6.4.1.

3.5.6.5 Instream Structures Alternative

3.5.6.5.1 Game Fish and Their Habitat

3.5.6.5.1.1 Impacts During Construction. Construction of this alternative has the potential to cause minor and temporary increases in soil erosion. This would lead to increased sediment deposition and associated nutrient concentrations in the Provo River that could potentially impact game fish and their habitat. However, the soil analysis in Section 3.8 (Soil Resources) concluded that construction activities would cause only negligible amounts of soil to enter the Provo River. Therefore, sedimentation is not expected to have any impacts on game fish spawning areas, and increases in nutrient concentrations would be insignificant.

The water quality analysis included an evaluation of potential water temperature impacts under the Instream Structures Alternative. There would be no change from baseline conditions because little riparian vegetation clearing would be required. There also would be no temperature-related impacts on game fish and their habitat.

3.5.6.5.1.2 Impacts After Construction. After construction, this alternative would result in changes in physical habitat characteristics, habitat quality attributes and predicted trout standing crop in the Provo River. Following are descriptions of these changes.

Physical Habitat Characteristics. Physical habitat characteristics of the river channel would generally not change under this alternative. Reach length and surface area would be the same as shown on Table 3-20 for baseline conditions. Side channels would not be constructed under the Instream Structures Alternative.

The addition of root wads or boulders to the Provo River channel would increase habitat complexity by breaking up the flow and creating pockets of relatively lower velocity. This change would benefit game fish species by providing holding or refuge areas in the channel but outside the main current.

Habitat Attributes. In general, most habitat attribute ratings increase compared to baseline conditions. No changes in baseline ratings were made in Reach 1 because this alternative does not include any improvements to that reach. The change in ratings is typically only to the next higher rating because this alternative only involves placing instream structures (log, boulders, and root wads) in the Provo River, with no other channel or habitat improvements.

The habitat attribute ratings for nitrate nitrogen and maximum summer stream temperature would not change from baseline conditions.

Predicted Trout Standing Crop. The habitat quality attribute ratings described above would lead to improved aquatic habitat quality and result in an increase in the predicted trout standing crop. Table 3-25 shows predicted trout standing crop and biomass in Reaches 1 through 9 under the Instream Structures Alternative and changes in these estimates from baseline conditions.

All reaches except Reach 1 would experience an increase in predicted trout standing crop and biomass. The increase in predicted trout standing crop under the Instream Structures Alternative ranges from zero to 46 pounds per acre (see Table 3-25). Overall predicted trout biomass would increase by 3,076 pounds (or 59 percent) compared to baseline conditions. This increase in predicted trout standing crop and biomass over baseline conditions is a positive impact resulting from the Instream Structures Alternative. It would take an estimated 15 to 20 years to reach the full potential of trout production as a result of the improvements in habitat quality. Management of the Provo River within the impact area of influence for natural production, with no supplementation from hatchery sources, would require a number of years of successful trout reproduction and recruitment to reach the predicted production levels. The Final EIS for the nearby Strawberry Valley Management Area estimated that it will take 15 to 20 years for natural trout production to reach full potential in the upper

Table 3-25
Summary of Impacts on Trout Standing Crop and Biomass Under the Instream Structures Alternative

	Predicted Trout Standing Crop[1]				Predicted Trout Biomass[2,3]			
Reach	Baseline (lb/acre)	Instream Structures Alternative (lb/acre)	Change from Baseline (lb/acre)	Percent Change from Baseline (%)	Baseline (pounds)	Instream Structures Alternative (pounds)	Change from Baseline (pounds)	Percent Change from Baseline (%)
1	84	84	-0-	-0-	410	410	-0-	-0-
2	66	112	46	70	582	981	399	69
3	43	71	28	65	446	746	300	67
4	66	112	46	70	820	1383	563	69
5	66	112	46	70	422	714	292	69
6	66	112	46	70	1163	1962	799	69
7	63	71	8	13	570	640	70	12
8	43	71	28	65	315	526	211	67
9	37	68	31	84	518	960	442	85
Totals	**n/a[4]**	**n/a**	**n/a**	**n/a**	**5,246**	**8,322**	**3,076**	**59**

Notes:

[1]Predicted Trout Standing Crop is the modeled living mass of trout per unit area of water.
[2]Predicted Trout Biomass is the modeled living mass of trout in the stream reach.
[3]Predicted trout biomass was determined by multiplying the surface area (acres) of habitat created in a reach by the predicted trout standing crop (pounds/acre) in that reach.
[4]n/a = not applicable

Strawberry River basin after eliminating the transbasin diversion (USFS 1990).

3.5.6.5.2 Non-Game Fish and Their Habitat

3.5.6.5.2.1 Impacts During Construction. Potential impacts of construction on non-game fish and their habitat are the same as described in Section 3.5.6.5.1.1 for game fish.

3.5.6.5.2.2 Impacts After Construction. Potential impacts after construction of the Instream Structures Alternative include changes in physical habitat characteristics, habitat quality attributes, and potential changes in standing crop of non-game fish. Following are descriptions of potential impacts after construction of this alternative.

Physical Habitat Characteristics. The physical habitat characteristics of the Instream Structures Alternative are described in Section 3.5.6.5.1.2. An increase in channel complexity from the addition of root wads or boulders would result in benefits to non-game fish species compared to baseline conditions.

Habitat Quality Attributes. The predicted changes in habitat attribute ratings under this alternative are described in Section 3.5.6.5.1.2. As previously stated, most of the ratings increase compared to baseline conditions. In general, the improvements in habitat conditions for game fish associated with this alternative would not result in a decrease in habitat quality for non-game fish.

Predicted Standing Crop. The Binns HQI Model II was developed to predict standing crop of trout populations, but is not appropriate for quantitative estimates of potential changes in non-game fish standing crop. However, it is likely that improvements in stream habitat under this alternative would result in an increase in the standing crop of non-game fish species.

3.5.6.5.3 Other Aquatic Resources

3.5.6.5.3.1 Impacts During Construction. Construction of this alternative would not result in any impacts to other aquatic resources for the same reasons described in Section 3.5.6.5.1.1 for game fish species and their habitat.

3.5.6.5.3.2 Impacts After Construction. Potential impacts after construction of this alternative would be the same as described in Section 3.5.6.5.2.2 for non-game fish and their habitat. Overall, improved physical characteristics of the Provo River and improved habitat quality attributes would have a positive impact on other aquatic resources.

3.5.6.5.4 Impact Summary. There would be short-term, potential water quality degradation during construction, but it would not be significant to game fish species and their habitat.

Predicted trout standing crop would generally increase compared to baseline conditions. The predicted increase ranges from zero to 46 pounds per acre. Reach 1 would be unchanged from baseline conditions. The total predicted trout biomass over all reaches increased by 3,076 pounds (or 59 percent) over baseline conditions.

Total stream length, width and aquatic habitat surface area would not change from baseline conditions. No side channels would be developed under this alternative.

Positive impacts on non-game fish and other aquatic resources would also generally be the same as described for game fish and their habitat in Section 3.5.6.5.1.

3.5.6.6 No Action Alternative

The No Action Alternative would result in a continuation of the baseline aquatic resources conditions described in Section 3.5.5. Routine dike and diversion maintenance would continue. Dike and diversion maintenance that occurred within the Provo River channel would result in localized sediment deposition and disruption or loss of aquatic habitat.

3.6 Wildlife Resources

3.6.1 Introduction

The wildlife resources analysis addresses potential impacts on wildlife species and their habitat from construction and maintenance of the Proposed Action and alternatives. The information and analysis documented in this section was summarized from the Wildlife Resources Technical Report (Mitigation Commission 1997f). Readers also are directed to Section 3.4 Wetlands, in the PRRP EIS,

for a detailed description of wildlife habitat wetland types. Potential impacts on listed and candidate threatened or endangered wildlife species are described in Section 3.7 of this EIS (Threatened, Endangered and Candidate Species), and are not considered under wildlife resources. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.5.

The following wildlife resources impact topics are addressed in this impact analysis:

- Game species (i.e., deer, fur-bearing mammals, waterfowl, upland game birds) and their habitat
- Non-game species (i.e., non-domestic small mammals, birds, reptiles, amphibians) and their habitat

3.6.2 Issues Eliminated From Further Analysis

None of the wildlife resources issues raised during scoping and defined in Section 3.6.3 have been eliminated from further analysis.

3.6.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- What are the potential impacts of project construction on wildlife and their habitat?
- What are the effects of pedestrian access on wildlife and their habitat?
- What are the impacts of potential redistribution of wildlife habitat and wildlife on local property owners?

3.6.4 Description of Impact Area of Influence

The wildlife resources impact area of influence (See Map 3-1 in Section 3.1.1.1.) consists of the zone of wetland, riparian and upland vegetation along the Provo River from the outlet of Jordanelle Reservoir downstream to Deer Creek Reservoir. It includes the following areas: lands within the boundary of the Core Area and Expanded Restoration Area for the Proposed Action; lands within the 100-year floodplain; and lands within the existing channel and floodplain that would be acquired under baseline conditions. The area generally averages about 1,000-feet wide over approximately 10 miles of river channel. The impact area of influence is referred to as the Project Area in the following discussion of the affected environment and the wildlife resources impact analysis.

The Provo River was divided into nine stream reaches for purposes of describing baseline conditions and documenting potential impacts under the Proposed Action and alternatives (see Map 3-1 in Section 3.1.1.1). It should be noted that no construction activities are planned in Reach 1 under the Proposed Action and alternatives, so no impacts are expected in this reach.

3.6.5 Affected Environment (Baseline Conditions)

3.6.5.1 Game Species and Their Habitats

Game species within the Provo River corridor include a number of mammals as well as waterfowl and upland bird species. Game species habitats include riparian woodlands and other riverine wetlands. Non-riparian wetland habitats include wet and moist meadows, emergent marsh, and shrub wetlands.

3.6.5.1.1 Mammals. Mule deer are common in the project vicinity and utilize upland, riparian woodland and non-riparian wetland habitats. The riparian woodlands provide shade, cover, browsing habitat and fawning sites (in June through July) for mule deer. The non-riparian wetlands and areas supporting grasses and grass-like plants provide forage and migration corridors for mule deer. Mule deer sightings are regular but not common in the Project Area. Most records are from Reaches 7, 8 and 9, where the riparian corridor is adjacent to undeveloped native uplands.

Other game species, including moose, bear, elk and mountain lion, have ranges that include the Provo River corridor. Elk and moose, which browse and find cover in riparian woodlands at certain times of the year, have been observed in the riparian woodland habitats in Reaches 8 and 9 of the Provo River corridor. The locations where they have been observed are adjacent to expansive tracts of

undeveloped uplands, such as portions of Wasatch Mountain State Park. Small fur-bearing mammals also are present in these areas. Bear and mountain lion are rare in the Provo River corridor because of vehicle traffic and the generally disturbed nature of the area. Mountain lion and bear are more likely to utilize the Provo River corridor riparian woodland habitats during dry years when they come down from higher-elevation habitats seeking water, forage and cover.

3.6.5.1.2 Birds. Game birds include waterfowl and upland game species. Waterfowl, such as mallard, gadwall, and Canada goose, which are seasonal and permanent residents of the Provo River corridor, frequent riparian woodlands and marshes and ponds in the non-riparian wetland habitat category, using them for nesting, cover and feeding. All waterfowl but mallards are rarely seen in the Project Area, and mallards are also considered uncommon (see Final Wildlife Resources Technical Report).

Waterfowl also use flooded fields on a seasonal basis for resting and feeding. These fields are part of the upland habitat type that includes irrigated and nonirrigated pasture land as well as native upland vegetation such as sagebrush. Most native upland habitats have been removed from the river ecosystem and converted to agricultural production. Remaining native upland vegetation is mostly found within Reach 8 with non-native upland vegetation occurring mostly within Reach 6.

Upland game birds, including turkey, grouse, quail, and chukar, are uncommon year-round residents of upland habitats in the Provo River corridor. They frequent both riparian woodland and non-riparian wetland habitat types such as woodland edges, irrigated pasture and marsh edges for nesting, cover, and feeding.

3.6.5.2 Non-Game Species and Their Habitats

3.6.5.2.1 Mammals. Non-game mammals include a number of fur-bearing species, such as foxes, coyote, beaver, mink, weasel, raccoon and bobcat. Riparian woodland is the primary habitat type of these species, but foxes and coyotes also frequent open, non-riparian wetland areas and wooded areas. Other mammals that frequent the Provo River corridor on a year-round basis are shrews, voles, mice, bats, rabbits, squirrels, skunk and porcupine, which use riparian woodlands for cover and foraging. Many also frequent wet areas associated with non-riparian wetlands as well as upland areas.

3.6.5.2.2 Birds. A diverse group of non-game bird species frequent the Provo River corridor, including raptors, migratory waterfowl and wading birds, gulls, shorebirds, woodpeckers, owls, flycatchers, swallows and passerine (perching) species. Raptor species reported to occur in the project area during breeding season include Red-tailed Hawk, Swainson's Hawk, Cooper's Hawk, American Kestrel, Osprey. Of these, the Red-tailed Hawk is uncommon, while all others are rare according to 1997 surveys (for criteria, see Final Wildlife Resources Technical Report). Red-tailed, Swainson's, and Cooper's Hawk build platform nests in mature riparian trees. Red-tailed and Swainson's Hawks, as well as most owls, forage primarily on small mammals, such as mice and voles. Cooper's Hawks hunt primarily on small songbirds. Ospreys were mostly seen in Reach 3, likely because a pair has been nesting for several years near the Fish Hatchery outside the Project Area. Ospreys forage by hunting for fish in the river and reservoirs. Bald Eagles, which use the Project Area in the winter have also been primarily observed in the lower three reaches, where they roost in mature trees and hunt for fish in the river and reservoir.

Waterfowl, wading birds, and shorebirds are primarily found in open wetlands, such as non-riparian wetlands and, to a lesser degree, the river channel. Woodpeckers, such as Northern Flicker and Downy Woodpecker, the two most common species, use mature and decaying trees for excavating nest cavities. Other birds, such as American Kestrel, Tree Swallow, and Black-capped Chickadee, use abandoned woodpecker nest cavities for breeding. Some species, such as the Belted Kingfisher, Bank Swallow, and Northern Rough-winged Swallow, use steep earthen banks for excavating nest burrows. Many songbirds nest in riparian shrubs and woodlands and forage on macroinvertebrates produced by the river and terrestrial invertebrates. The most common songbird species in the Project Area are American Goldfinch, American Robin, Brown-headed Cowbird, European Starling, Red-winged Blackbird, Song Sparrow, Warbling Vireo, Western Wood-Pewee, and Yellow Warbler.

During a breeding bird survey by UDWR in 1997, relative abundances of birds were assessed in all

reaches of the Provo River. A total of 99 different species of birds were observed. Reaches 4 and 2 had the highest local species richness and the highest richness in riparian species (Table 3-26). Reaches 4 and 5 had the greatest estimated density of birds per acre, meeting or exceeding the estimated density in the reference site. Reach 4 also had the highest density of riparian birds, whereas Reaches 6, 7, and 8 had the lowest density of riparian birds (see Table 3-26).

3.6.5.2.3 Reptiles and Amphibians. Reptile and amphibian species known to occur in the Provo River corridor include spotted frogs, boreal chorus frogs, tiger salamander, wandering garter snake, and Great Basin gopher snake. Historic records exist for boreal toad, Woodhouse's toad, and leopard frog; however, these species have not been reported in the recent past for the Project Area. Several species of lizards, skinks, and six additional species of snakes, all of which are primarily found in non-riparian uplands, may also occur in the Project Area. The Final Wildlife Resources Technical Report (Mitigation Commission 1997f) includes a listing of reptile and amphibian species. Lizards prey on insects and are found on open ground, sagebrush and rocky areas. Snakes feed on small mammals, frogs, insects and spiders and are found in upland habitats and edge areas of riparian woodlands and non-riparian wetlands in the Provo River corridor. Frogs and toads feed on insects and worms and frequent grasslands, brushy areas, marshes, streams and ponds in the Provo River corridor. Salamanders feed on worms and insects and are typically found in ponds, marshes, streams and other wet areas of the riparian woodland habitat.

3.6.6 Impact Analysis

3.6.6.1 Significance Criteria

Riparian woodlands provide high-quality natural habitat, are biologically diverse, and possess specific ecological attributes that make them important in wildlife management. Wildlife species use riparian woodlands for their high palatability of forage, high productivity, shade, thermal cover during winter, and proximity to other habitat components. They also are frequently used as migration corridors because they offer cover, food and water for moving between summer and winter ranges. The importance of riparian woodlands to wildlife is also one of the key considerations of wetlands functions and values. Since wetlands are important in both a regulatory and biological sense, any permanent impacts on riparian habitat types were considered significant. Native, upland woodland vegetation in the impact area of influence is an abundant habitat type.

The following potential impacts of the Proposed Action and alternatives on game and non-game wildlife and wildlife habitat are considered significant:

- Activities resulting in permanent removal or expansion of any existing riparian woodland habitat
- Activities resulting in permanent removal or expansion of any important game-species habitat (e.g., deer fawning areas and migratory routes)
- Activities resulting in removal, disturbance, or expansion of mule deer fawning areas during June and July (the fawning period) when it could lead to changes in fawning success and survival of deer
- Activities resulting in permanent removal or expansion of habitat for non-game species
- Activities resulting in removal or expansion of native upland habitat in the Provo River corridor
- Activities resulting in removal or expansion of any existing non-riparian wetland habitat or native upland habitat in addition to existing riparian habitat along the Provo River corridor.

3.6.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential wildlife resources impacts have been eliminated from further analysis.

3.6.6.3 Proposed Action (Riverine Habitat Restoration)

The following subsections define potential wildlife resources impacts during the construction and operation phases of the Proposed Action. Construction would be phased, one segment (which could include one or more reaches) at a time, beginning upstream at Reach 9 below Jordanelle

Table 3-26
Breeding Bird Diversity and Abundance Patterns Along the Provo River Corridor[1]

	Total # Bird Species	% Riparian Species[2]	Avg. # of Birds Per Acre[2]	Avg. # of Riparian Birds Per Acre[2]	Estimated Bird Population[2]
Provo River Reaches					
1	35	21 (84%)	10	9	—
2	41	31 (76%)	9	7	337
3	35	28 (80%)	6	6	232
4	43	32 (75%)	14	13	1,375
5	24	15 (61%)	11	8	109
6	37	29 (78%)	3	3	60
7	25	17 (69%)	5	3	159
8	22	20 (92%)	3	3	132
9	36	32 (90%)	8	7	421
Reference Site					
Diamond Fork	n/a	84%	11	10	2,825

Notes:

[1]All data based on breeding bird surveys conducted between 15 May and 15 July 1997; birds were counted a total of 3 times for the Provo River and 2 times for Diamond Fork; censuses were done within 50-m-radius circular plots; for more details on the methods, see Wildlife Resources Technical Report.
[2]All estimates based on 2 counts.

Reservoir and ending downstream at Reach 2. The phased approach would further limit disturbances of game species to the immediate area of the segment under construction rather than affecting the entire Provo River corridor at the same time. Construction would occur in only one segment at a time, which would allow wildlife to move to undisturbed reaches and avoid the immediate zone of construction activities. This is an important consideration since the Provo River corridor provides a significant portion of existing wildlife habitat in the Heber Valley.

3.6.6.3.1 Impacts During Construction. Construction of the Proposed Action would cause the following types of impacts on wildlife resources:

- Disturb and displace resident and non-resident game and non-game species as a result of noise generated by construction machinery and construction worker activities during the construction period

- Remove riparian woodland and non-riparian wetland habitat used by game and non-game species for the period of time required for revegetated areas to grow to a size and height that provides wildlife habitat for foraging, cover, resting and breeding

3.6.6.3.1.1 Game Species and Their Habitat. Construction activities would temporarily disturb and displace resident and non-resident mule deer and reduce their use of habitats adjacent to construction areas as a result of increased noise and activity levels. In Reaches 7 through 9, where most of the deer of the Project Area occur, many of the affected individuals may escape direct construction impacts by moving into the adjacent oak-maple uplands. Also, a large portion of the existing riparian habitats in Reaches 7 and 8 will not be impacted directly by construction, and therefore available for deer retreat. Some mule deer potentially could be killed by construction vehicles, but this would be minimized by strict enforcement of speed limits. Resident mule deer fawn during June and July in riparian woodlands, shrubby areas and mature grasslands at the edge of forested cover. Disturbances during this time may result in abandonment of fawning areas, but these areas are little utilized because of existing and continuing human disturbance. There should be no significant impact on important game species habitat such as mule deer fawning areas.

Game species other than deer would likely avoid the immediate areas of construction because of noise and worker activity. No other important habitat for game species occurs in the Provo River corridor except that for mule deer fawning discussed in this section. As a result, no significant impacts would occur to important habitat of other game species.

Certain wildlife habitat types would be locally removed during construction of the Proposed Action. These areas would be re-vegetated with native riparian or wetland vegetation. Depending on habitat type, it would take up to 15 growing seasons for habitat to grow to comparable size and height of pre-construction conditions. Table 3-27 summarizes the negative impacts, i.e., the acres of wildlife habitat that would be disturbed and the number of cottonwood trees that would be removed. Establishing a diverse age-structure of riparian forest will significantly increase habitat availability for both game and non-game wildlife in the long-term. In many cases, the positive impacts of the Proposed Action on wildlife would occur as early as the first few years of implementation, because the acquired land would be immediately protected from development and agricultural uses. Also, habitats that are currently dominated by exotic species and of inferior value to wildlife, such as agricultural fields and pastures, would be converted into valuable wildlife habitat through revegetation efforts and restoration of fluvial processes that allow recovery of native riparian vegetation.

Construction of the Proposed Action would remove 13.3 acres of riparian woodlands and 66.7 acres of non-riparian wetlands. Construction would also remove 973 cottonwood trees. This would impact mammal and bird game species by eliminating areas of foraging, resting, breeding and cover. Revegetation or development of new habitat as part of the Proposed Action would enhance or create 287.6 total acres of wetland wildlife habitat. Habitat types enhanced or created include 251.0 acres of riverbank and floodplain riparian woodlands and 36.6 acres of other riverine wetland habitat consisting of shrub wetlands, emergent marsh, open water and side channel wet meadow. This would result in a net increase of 207.6 acres of wetland wildlife habitat.

In addition, approximately 309.7 acres of existing and undeveloped upland and riparian habitats would be permanently protected as wildlife habitat under the Proposed Action. These lands are currently

Table 3-27
Acres of Wildlife Habitat and Number of Cottonwood Trees Permanently Removed Under Construction of the Proposed Action

	Habitat Type			
Reach	**Riparian Woodland[1] (acres)**	**Non-Riparian Wetland[2] (acres)**	**Upland (acres)**	**Cottonwood Trees (number of trees)**
1	0.0	0.0	0.0	0.0
2	0.2	5.2	0.0	140
3	4.0	4.6	0.0	79
4	0.0	3.0	4.1	0.0
5	1.0	10.0	5.9	125
6	0.8	4.2	43.1	335
7	0.0	11.4	0.0	29
8	1.2	11.8	0.0	28
9	6.1	16.5	7.5	237
Total	**13.3**	**66.7**	**60.6**	**973**

Note:

[1]Riparian woodland includes the riparian wetland vegetation types.
[2]Non-riparian wetland includes the wet meadow, moist meadow, shrub wetland and emergent marsh wetland vegetation types.

vulnerable to development. There would be no significant adverse impacts on non-game wildlife species because riparian woodland or non-riparian wetland habitat would not be permanently removed.

3.6.6.3.1.2 Non-Game Species and Their Habitat. Noise and activity levels from construction would temporarily disturb and displace resident and seasonal non-game species, resulting in displacement of wildlife from nesting sites, feeding areas and cover. Some of the less mobile wildlife could be lost by disturbance from construction and heavy equipment. In some cases, small mammals (squirrels, mice and rabbits), which are the primary food source for raptors that frequent the corridor, may be lost. Migratory birds may avoid construction areas, potentially resulting in longer flights to seek undisturbed and less noisy resting and feeding places. Bird losses in the construction area are estimated to total 121 birds based on removal of riparian woodland habitats (Table 3-28). These losses would not necessarily result from direct mortality, but from removing habitats currently used by breeding birds.

Construction activities that remove riparian and non-riparian habitat (see Table 3-27) would cause loss of nesting sites, feeding areas and cover for non-game species. As described under game species and their habitat in Section 3.6.6.3.1.1, more of these habitat types would be developed under the Proposed Action than would be removed during construction. Phased construction would gradually remove this habitat. Revegetation would require up to 30 years to reach full habitat value after construction, depending on habitat type. No significant impacts on non-game species are expected to occur from construction of the Proposed Action because (1) after land acquisition, wildlife habitats in the Provo River corridor would be immediately protected from land use impacts such as livestock grazing, (2) there would be no permanent removal of riparian woodland and non-riparian wetland habitat, and (3) revegetation sites that would need up to 15 years to mature would already be valuable to non-game wildlife long before their mature state is reached.

Temporary construction impacts could especially impact bird species such as woodpeckers, which rely

Table 3-28
Expected Changes in Bird Populations Under the Proposed Action

Reach	Avg. # of Birds Lost to Riparian Habitat Removal[2]		Avg. # of Birds Gained from Riparian Habitat Creation[1]		Avg. # of Birds Gained from Net Riparian Habitat Change	
1	0	(—)	0	(—)	0	(—)
2	3	(-1%)	363	(+108%)	360	(+107%)
3	36	(-15%)	459	(+198%)	423	(+182%)
4	0	(0%)	476	(+35%)	476	(+35%)
5	12	(-11%)	234	(+215%)	222	(+204%)
6	2	(-3%)	549	(+195%)	547	(+912%)
7	0	(0%)	187	(+118%)	187	(+118%)
8	6	(-5%)	167	(+126%)	161	(+122%)
9	62	(-34%)	326	(+77%)	264	(+44%)
Total	**121**	**(-4%)**	**2761**	**(+98%)**	**2640**	**(+94%)**

Notes:

[1]Calculated using the average number of birds per acre in the reference site.
[2]Percent change (in parenthesis) based on estimated total number of birds in each reach under baseline.

on mature trees with soft wood for constructing nesting cavities and capturing insects. These types of birds would be impacted during the time it takes for the forest to completely mature , which is 10 to 15 years for cottonwoods and 3 to 5 years for the shrub understory. Other birds, for example the willow flycatcher or song sparrows, which rely on sandbar willows and other early-successional riparian vegetation, would benefit from revegetation in 2 to 5 years. Once re-established, the riparian woodland habitat should provide more habitat value than it does under baseline conditions. Natural recruitment of cottonwood trees would provide mixed stands of several age classes, and the shrub understory is expected have additional species and occupy a wider area under the cottonwood canopy. Thus, there would be a greater diversity of vegetative types in the riparian corridor than under current baseline conditions. The impact of removing cottonwood trees would not be significant for birds and other non-game species since this type of habitat would not be permanently removed and the revegetation following construction is expected to result in a more diverse habitat over a larger area compared to baseline conditions.

Construction would remove 60.6 acres of upland habitat type, primarily in Reach 6 (see Table 3-27). This would be largely irrigated pasture, not native upland plant species. This habitat type is used by a number of non-game species, but is not as important to non-game species as native upland vegetation or riparian woodland and other riverine wetland types. Irrigated pasture land is also common along the Provo River corridor and Heber Valley. Non-game species are not expected to be significantly impacted because existing native upland habitat adjacent to the Provo River corridor would not be permanently removed.

3.6.6.3.2 Impacts After Construction. After construction, the Proposed Action would cause the following types of impacts on wildlife resources:

- Increase in the numbers of game and non-game wildlife and sightings by local landowners and other visitors to the Project Area as a result of additional area of habitat
- Improvement in wildlife habitat along the Provo River corridor by fencing the area to be developed and excluding livestock grazing

- Increase in wildlife habitat due to river restoration: (1) increase in acreage, (2) creation of movement corridors, and (3) increase in habitat quality due to protection of land for other uses
- Increase in diversity of native riparian habitats and other riverine wetland types.
- Increased disturbance of game and non-game species as a result of pedestrian access to the Provo River corridor. This impact would be reduced through measures adopted via the Operating Agreement described in Section 1.4.2 of Chapter 1, to protect sensitive habitats.

3.6.6.3.2.1 Game Species and Their Habitats. Once the revegetated areas are established, distribution and activity of game species would resume to baseline levels or higher due to habitat improvement. Additional wildlife habitat only would be developed on land managed by the federal government, not on private property. Adjacent property owners would experience slightly higher levels of game species activity and wildlife sightings because of the increased wildlife habitat. This would probably include increased animal movements across agricultural lands to reach riparian woodland and non-riparian wetland habitats along the Provo River corridor, similar to the situation under baseline conditions.

The access easement area along the Provo River corridor would be fenced to exclude livestock grazing. This would allow riparian and non-riparian vegetation to grow and mature, which would enhance the quality of wildlife habitat used for forage, cover, resting or nesting compared to baseline conditions. This would be a positive impact of the Proposed Action.

The protection, enhancement, and restoration of the riparian corridor of the Provo River would increase the availability of deer fawning sites, cover, and foraging habitat. Also, by protecting and restoring enough land to form a wide riparian corridor, movement of deer along the riparian corridor and movements from the native uplands of Reaches 7 to 9 into the entire river corridor would be improved. Upland game birds, such as wild turkey and pheasants, use dense riparian understory vegetation for cover. Therefore, through exclusion of livestock grazing and restoration of riparian habitats, the Proposed Action would result in an increase in game habitat, once the construction sites are revegetated and the riparian vegetation has matured and expanded.

Increased pedestrian access would disturb game species, especially during June and July during mule deer fawning. The recreation analysis (see Section 3.16) concluded that angler use of the corridor would increase by 481 percent over baseline. Even though very few and limited trails would be developed in the riparian zone, footpaths used by anglers along the river between the access points would become established over time. Other recreationists may use these paths and create additional ones through portions of the riparian zone. The degree of disturbance is not quantifiable, but is expected to be minor since use would be restricted to foot traffic.

3.6.6.3.2.2 Non-Game Species and Their Habitats. Many of the impacts on non-game wildlife and their habitat after construction of the Proposed Action would be the same as described for game species in Section 3.6.6.3.2.1. The main temporary impacts include the retreat of wildlife from the construction area and the removal of wildlife habitat by construction. With the revegetation and expansion of native riparian forest, the long-term impacts of the Proposed Action on non-game wildlife would be beneficial, because large areas of agricultural land would be converted into protected wildlife habitat and restoration would result in a net gain of native habitats and movement corridors for wildlife.

The total estimated number of birds lost to riparian woodland habitat removal would be 121 (4 percent of the estimated baseline population) under the Proposed Action (Table 3-28). As a result of river restoration under the Proposed Action, an estimated total of 2,761 birds (a 98 percent increase) would be gained from the creation of riparian woodland habitat for a net increase of 2,640 birds (a 94 percent increase). Based on data from a relatively intact reference site, about 91 percent of these birds should be riparian-dependent species (for definition, see Wildlife Resources Technical Report). Additionally, as for game species, improvements in habitat quality should also be expected due to the shift in land use from livestock grazing and agriculture to protected wildlife habitat. Two bird species often associated with ecological disturbance and grazing are the brown-headed cowbird and

European starling. As the riparian tree canopy becomes less fragmented, denser, and develops a dense shrub understory under the Proposed Action, the occurrence of these species should become less frequent.

Due to an increase in habitat diversity and the reconnection of fragments of existing native habitats by creation of riparian and non-riparian wetland habitats within the corridor (see Figure 1-1 in Chapter 1), the overall diversity and density of native wildlife is expected to increase.

3.6.6.3.3 Impact Summary. Game species would be temporarily disturbed during construction from noise and human activity, possibly resulting in their displacement from the immediate construction area. Permanent removal of 13.3 acres of riparian woodland and 66.7 acres of non-riparian wetland habitat types during construction would be offset by enhancement and creation of 287.6 acres of riparian woodland and other riverine wetland habitat, a net increase of 207.6 acres of wetland wildlife habitat. Approximately 309.7 acres of existing undeveloped upland and riparian habitats would be permanently protected as wildlife habitat under the Proposed Action. Revegetated areas would provide wildlife habitat once they are established, which would take two growing seasons for non-riparian wetland, 3 to 5 years for understory shrub species and 15 to 30 years for overstory cottonwoods in riparian woodlands. Development of additional acreage of riparian woodland and non-riparian wetland habitat and permanent protection of undeveloped upland and riparian habitat would have a positive impact on game species.

Impacts on non-game species and their habitats would be generally the same as described for game species. Estimates of net changes in breeding bird populations under the Proposed Action indicate that development of additional acreage of riparian woodland and other riverine wetland habitat would have a substantial positive impact on non-game bird species.

3.6.6.4 Existing Channel Modification Alternative

The following subsections define potential wildlife resources impacts during construction and operation of the Existing Channel Modification Alternative.

3.6.6.4.1 Impacts During Construction. Construction of this alternative would cause the following types of impacts on wildlife resources:

- Disturb and displace resident and non-resident game and non-game species as a result of noise generated by machinery and workers
- Remove riparian woodland and non-riparian wetland habitat used by game and non-game species during the time required for revegetated areas to grow to a size and height that provides wildlife habitat for foraging, cover, resting and breeding

3.6.6.4.1.1 Game Species and Their Habitat. Construction activities would temporarily disturb and displace resident and non-resident mule deer and other game species for the same reasons described for the Proposed Action in Section 3.6.6.3.1.1.

Certain wildlife habitat types also would be removed during construction of this alternative. Although these areas would be revegetated to the extent possible, the time required to grow to comparable size and height of the habitat removed ranges from two growing seasons to 15 years depending on the habitat type. Table 3-29 summarizes the acres of wildlife habitat and number of cottonwood trees that would be permanently removed by construction of the Existing Channel Modification Alternative.

A total of 37.6 acres of riparian woodland and 25.5 acres of non-riparian wetland would be removed under this alternative (see Table 3-29). In addition, 1,080 cottonwood trees would be removed. Wildlife habitat removed during construction would be revegetated to the extent possible, and a total of 141.9 acres of riparian woodland habitat would be developed, resulting in a net increase of 78.8 acres of wildlife habitat. Following revegetation, it would take 3 to 5 years for shrubs and 15 to 30 years for cottonwoods to reach a height and size comparable to those removed. This impact would not be significant to game species since there would be no permanent loss of riparian woodland or other riverine wetland habitat.

3.6.6.4.1.2 Non-game Species and Their Habitats. Construction of the Existing Channel Modification Alternative would result in removal of riparian woodland and non-riparian wetland habitat as described above for game species in Section 3.6.6.4.1.1. This would result in lost

Table 3-29
Acres of Wildlife Habitat Disturbed and Number of Cottonwood Trees Removed Under the Existing Channel Modification Alternative

Reach	Habitat Type			
	Riparian Woodland[1] (acres)	Non-Riparian Wetland[2] (acres)	Upland (acres)	Cottonwood Trees (number of trees)
1	0.0	0.0	0.0	0
2	8.6	2.3	0.0	140
3	10.1	3.8	0.0	170
4	0.0	2.6	0.0	0
5	0.0	0.0	0.0	0
6	1.3	2.3	0.0	135
7	2.5	0.9	0.0	55
8	8.7	9.1	0.0	230
9	6.4	8.6	0.0	350
Total	**37.6**	**25.5**	**0.0**	**1,080**

Notes:

[1]Riparian woodland includes the riparian wetland and shrub wetland vegetation types.
[2]Non-riparian wetland includes the wet meadow, moist meadow and shrub wetland vegetation types.

nesting, breeding and feeding habitat for many avian species and small mammals during the time described in Section 3.6.6.4.1.1. There would be no significant impacts on non-game wildlife species because riparian woodland or non-riparian wetland habitat would not be permanently removed.

3.6.6.4.2 Impacts After Construction. After construction, this alternative would have the following types of impacts on wildlife resources:

- Resumption of baseline activity levels for game and non-game wildlife as revegetated areas mature
- Improvement in wildlife habitat along the Provo River corridor by fencing the area to be developed and excluding livestock grazing
- Increase in available wildlife habitat and movement corridors along the Provo River due to habitat restoration and land protection
- Minor increased disturbance of game and non-game species as a result of pedestrian access to the Provo River corridor

3.6.6.4.2.1 Game Species and Their Habitat. Potential negative impacts on game species and their habitat from operation of this alternative would generally be the same as described for the Proposed Action in Section 3.6.6.3.2.1. Positive impacts for game species include the protection of the existing channel corridor and creation of additional riparian woodland and other riverine wetlands habitat.

Increased pedestrian access could disturb game species, especially during June and July during mule deer fawning. The recreation analysis (Section 3.16) concluded that angler use of the corridor under this alternative would increase by 151 percent over baseline. The impact of footpaths along the riparian zone would be the same as described in Section 3.6.6.3.2.1 above for game species and their habitats.

3.6.6.4.2.2 Non-Game Species and Their Habitats. Negative impacts on non-game species and their habitats after construction of this alternative would mostly be the same as described in Section 3.6.6.4.1.2 for the Proposed Action. However, an estimated 232 (8 percent) breeding birds would be lost to the removal of existing

riparian woodland habitat, and a net increase of 1328 (an increase of 47 percent) breeding birds is expected due to habitat creation under the Existing Channel Modification Alternative (see Table 3-30).

3.6.6.4.3 Impact Summary. Game species would be temporarily disturbed by noise and human activity during construction, possibly displacing them from the immediate construction area.. The 63.1 acres of riparian woodland and non-riparian wetland habitat types removed during construction would be replaced by revegetation and development of 141.9 acres of riparian woodland and non-riparian wetland habitat. The net increase in riparian woodlands would therefore constitute a positive impact on game species and their habitat. Revegetated areas would provide wildlife habitat once established, which would take two growing seasons to 5 years for wetland types other than woodlands, 3 to 5 years for understory species in riparian woodlands wetlands, and 10 to 15 years for overstory riparian cottonwoods.

Impacts on non-game species and their habitats are generally the same as described for game species.

3.6.6.5 Instream Structures Alternative

The following subsections define potential wildlife resources impacts during construction and operation of the Instream Structures Alternative.

3.6.6.5.1 Impacts During Construction. Construction of this alternative would cause the following types of impacts on wildlife resources:

- Disturb and displace resident and non-resident game and non-game species from noise generated by construction machinery and workers

3.6.6.5.1.1 Game Species and Their Habitat. Construction activities would disturb and displace resident and non-resident mule deer and other game species for the same reasons described for the Proposed Action in Section 3.6.6.3.1.1. SOPs for the Instream Structures Alternative would prevent disturbance of important game habitat, such as mule deer fawning areas. There would be no significant impacts on important game species habitat since these areas would be avoided during construction. There would be no significant impacts on wildlife habitat for game species because there would be no permanent removal of riparian woodland or non-riparian wetland habitat.

3.6.6.5.1.2 Non-Game Species and Their Habitats. Construction of this alternative would have the same impacts on non-game species as described in Section 3.6.6.5.1.1 for game species. No non-game wildlife habitat would be permanently removed by construction of this alternative, therefore no significant impacts would occur.

3.6.6.5.2 Impacts After Construction. This alternative would have no impacts on game or non-game species or their habitat after construction. No impacts would occur to adjacent property owners caused by redistribution of wildlife and wildlife habitat because there would be no change from baseline levels of activity.

Increased pedestrian access could disturb some game species, especially during June and July during mule deer fawning. The recreation analysis (Section 3.16) concluded that angler use of the corridor under this alternative would increase by 59 percent over baseline. The impact of footpaths along the riparian zone would be the same as described in Section 3.6.6.3.2.1 above for game species and their habitats.

3.6.6.5.3 Impact Summary. Noise and worker activity during construction of this alternative would temporarily disturb and displace some game and non-game wildlife. No significant impacts are expected because no game or non-game wildlife habitat would be permanently removed. After construction, this alternative would have no significant impact on game or non-game species of wildlife because there would be no changes in wildlife habitat from baseline conditions.

3.6.6.6 No Action Alternative

The No Action Alternative would result in a continuation of the baseline wildlife conditions described in Section 3.6.5. Routine dike maintenance and the associated loss of riparian vegetation and decline of the wildlife community along the dikes would continue.

Table 3-30 Expected Changes in Breeding Bird Populations Under the Existing Channel Modification			
Reach	Avg. # of Birds Lost to Habitat Removal[2]	Avg. # of Birds Gained from Habitat Creation[1]	Avg. # of Birds Gained from Net Habitat Change
1	0 (—)	0 (—)	0 (—)
2	77 (-23%)	110 (+33%)	33 (+10%)
3	61 (2-6%)	232 (+100%)	171 (+74%)
4	0 (0%)	0 (0%)	0 (0%)
5	0 (0%)	152 (+139%)	152 (+139%)
6	4 (-7%)	274 (+457%)	270 (+450%)
7	13 (-8%)	125 (+79%)	112 (+70%)
8	26 (-20%)	401 (+304%)	375 (+284%)
9	51 (-12%)	266 (+63%)	215 (+41%)
Total	**232 (-8%)**	**1560 (+55%)**	**1328 (+47%)**

Notes:

[1]Calculated using the average number of birds per acre in the reference site.
[2]Percent change (in parenthesis) based on estimated total number of birds in each reach under baseline.

3.7 Threatened, Endangered, and Candidate Species

3.7.1 Introduction

The threatened, endangered and candidate (T&E) species analysis addresses potential impacts on T&E and candidate species from the construction and maintenance of the Proposed Action and alternatives. A threatened, endangered or candidate status is assigned to individual species by the U.S. Fish and Wildlife Service (FWS). Species that are in danger of extinction in all or a significant portion of their range are designated as endangered. If a species is not currently in danger of extinction, but is likely to be in the foreseeable future, the species is assigned a threatened status. Candidate species are those for which a listing is possibly warranted pending further review. Listed species are provided protection under the Endangered Species Act (ESA) of 1973 (PL 93-205, as amended) against federally authorized or funded actions that may jeopardize their continued existence. In compliance with Section 7(C) of the ESA, a Biological Assessment was submitted to the FWS to disclose effects of the Proposed Action on T&E species. The information presented in this section was summarized from the Threatened and Endangered Species Technical Report (Mitigation Commission 1997g), which is available upon request. The focus of the analysis is on all T&E species potentially occurring in the impact area of influence. Impacts analyzed include direct, indirect, temporary and long-term effects.

The following species were included in the T&E species analysis: peregrine falcon, bald eagle, Ute ladies'-tresses, spotted frog, whooping crane, June sucker, and Utah valvata snail.

The methods used to assess impacts on T&E species are provided in Appendix B, Section B.2.6. For each species, the following impact topics were analyzed:

- The taking of a species (see Appendix B, Section B.2.6 for a definition of "take")
- Loss, degradation or expansion of habitat
- Increased stress, displacement or reduced reproductive success

3.7.2 Issues Eliminated from Further Consideration

The FWS, in several letters, has identified specific concerns related to potential project impacts on T&E species. However, most of the species identified by the FWS as potentially occurring in the impact area of influence were eliminated from further consideration because Category-2 (C-2) species have been removed from FWS protection, and/or there is low potential for occurrence in the impact area of influence. The FWS issued a directive in July 1995 that eliminated all C-2 species from the list, including the following: northern goshawk, ferruginous hawk, western snowy plover, loggerhead shrike, white-faced ibis, black tern, western least bittern, spotted bat, North American lynx, Utah hydroporus diving beetle, leatherside chub, Bonneville cutthroat trout, flannelmouth sucker, roundtail chub, Utah physa and thickshell pondsnail. The determination of low potential for occurrence was based on a preliminary analysis indicating lack of habitat, or presence of unsuitable conditions (i.e., high levels of disturbance). Species later eliminated because of a low potential for occurrence included the whooping crane, Utah valvata snail, and June sucker.

Another related issue that was eliminated from further consideration is: how would spotted frog egg masses be impacted by extreme fluctuations in spring water levels at the U.S. Bureau of Reclamation (USBR) wetland mitigation site? The issue was dismissed because the Proposed Action and alternatives would not influence spring water levels in the USBR wetlands.

3.7.3 Issues Addressed in the Impact Analysis

In compliance with the ESA, the FWS provided the Mitigation Commission with an updated list of T&E species that potentially occur in the impact area of influence (see Appendix C). The list contains federally designated plant, fish and wildlife species. Species of particular concern to the FWS and Utah Division of Wildlife Resources are the spotted frog, leatherside chub and Ute ladies'-tresses, all known to be present in the impact area of influence. Leatherside chub is not a candidate species and was eliminated from further consideration as a T&E species. It is addressed instead in the Aquatic Resources section (Section 3.5 of this chapter).

3.7.4 Description of the Impact Area of Influence

The impact area of influence is the Provo River corridor between Jordanelle Dam and Deer Creek Reservoir (see Map 3-1 in Section 3.1.1.1). The Provo River consists of the river, floodplain and surrounding riparian and wetland habitats.

3.7.5 Affected Environment (Baseline Conditions)

For T&E species, baseline conditions were considered to be the same as existing conditions. Table 3-31 lists T&E species known to occur in the impact area of influence. June sucker is not known to occur in the impact area of influence. Table 3-31 briefly describes the season of occurrence, sighting information and types and quality of habitat in the impact area of influence for each species. General life history traits, sighting information and habitat availability are presented following Table 3-31.

3.7.5.1 Peregrine Falcon

Peregrine falcons typically nest on cliffs with a combination of steep vertical surfaces to prevent predation and use ledges and cracks for scrapes and roost sites. They show a strong fidelity to nest sites (FWS 1984, Kilpatrick 1987). Nesting cliffs often are located near abundant and accessible avian prey, usually within 10 miles of a forage area. Foraging areas include forests, grasslands, marshes and open bodies of water where the peregrines' primary prey are available. Most prey consists of small to medium-sized songbirds, shorebirds and waterfowl. Winter habitat is selected on the basis of large concentrations of prey birds (Reel et al. 1989).

Nesting in the impact area of influence is unlikely and has not been reported. In Heber Valley, the potential for peregrine falcons to nest on slopes surrounding the impact area of influence is limited by the lack of appropriate habitat (i.e., absence of vertical cliff faces, talus and rock outcrops).

Very rarely have peregrine falcons been reported in Heber Valley. The few confirmed sightings occurred during the post-breeding season, i.e. the individual

Table 3-31
Summary of T&E Species Known to Occur in the PRRP Impact Area of Influence

Species	Season of Occurrence	Sighting Information	Habitat Type	Habitat Quality
ENDANGERED SPECIES				
Peregrine falcon (*Falco peregrinus*)	Spring and fall migration	No documented occurrences	Emergent marsh, ponds, wet meadow for foraging	Optimal foraging habitat in some areas
THREATENED SPECIES				
Bald eagle (*Haliaeetus leucocephalus*)	Winter	Known to roost and perch near the Provo River	Riparian forest	Optimal roosting habitat along Provo River and tributaries
Ute ladies'-tresses (*Spiranthes diluvialis*)	Year-round	Six colonies have been identified between Jordanelle Reservoir and Deer Creek Reservoir near the Provo River	Wetland and riparian habitats	Good habitat along the northern portion of Provo River in Heber Valley and along Snake Creek; marginal to poor elsewhere
CANDIDATE SPECIES				
Spotted frog (*Rana luteiventris*)[a]	Year-round	Populations near the Provo River between the Jordanelle and Deer Creek reservoirs	Ponds, wet meadow, and emergent marsh	Marginal to good in areas currently inhabited; marginal to poor elsewhere

Notes:

[a]The FWS has determined that *Rana luteiventris* is the correct name for the spotted frog. However, the taxonomy is unresolved and the spotted frog is also referred to by some scientists as *Rana pretiosa*.

was most likely seen during a migration stop-over. Although not reported, peregrine falcons also potentially forage in Heber Valley. Occurrences of peregrine falcon in the impact area of influence would be infrequent and for short periods of time. Foraging habitat is primarily associated with riparian areas, such as shrub wetlands, wet meadows and emergent marshes, that support high densities of waterfowl and song birds during spring and fall migration.

3.7.5.2 Bald Eagle

Bald eagles typically nest in large ponderosa pine, Douglas-fir and cottonwood trees. Fish and waterfowl are the primary prey, with rabbits and carrion utilized to a lesser extent. Foraging habitat consists of large, unobstructed open areas such as openings in river corridors or lakes. Eagles also concentrate around big-game winter range and consistent sources of carrion associated with road kills (Paige et al. 1990, DeGraff et al. 1991). Perching and roost sites (on large trees with open branches) and access to prey are important habitat characteristics for bald eagles during the winter (Paige et al. 1990). Bald eagles have yearly fidelity to the same tree for roosting and nesting. They are intolerant of human disturbance, especially during the breeding season (FWS 1986). Consequently, they normally locate perches and nest sites away from human disturbances or move them if they are disturbed.

Bald eagles are known to use the impact area of influence for wintering and as a stopover during migration. In particular, they use riparian corridors associated with the Provo River between Jordanelle and Deer Creek Reservoirs, Lake Creek and Center Creek for winter roosting and foraging (Cranney, 1995). In general, occurrences in the impact area of influence are limited to a few individuals reported near Deer Creek Reservoir, and the area does not support sizable winter concentrations.

Habitat in the impact area of influence is composed of a narrow band of riparian woodlands associated with the Provo River, Lake Creek and Center Creek. The water bodies support a variety of prey species, including brown trout, rainbow trout, mountain whitefish, longnose dace and mountain sucker (Bear West 1993).

3.7.5.3 Ute Ladies'-tresses Orchid

The Ute ladies'-tresses orchid occurs in open-canopied wetland and riparian areas in three distinct geographic areas: the eastern great basin of Utah and Nevada, the Colorado River drainage of eastern Utah, and the eastern front of the Rocky Mountains from southern Wyoming to south of Denver (Stone 1993). All known populations of Ute ladies'-tresses in Utah inhabit wetland sites (FWS 1992, UNHP 1994). Plants have most often been found in old stream channels and on fluvial deposits in the floodplain of adjacent rivers (UNHP 1994).

Groundwater and surface river water contribute to the wetland character of these sites. The species appears to have an affinity for dynamic river systems and other areas that have recently been affected by ground-disturbing activities, as evidenced by its location in old gravel pits and other disturbed areas. Other suspected important environmental parameters are sufficient exposure to sunlight, adequate dispersal of seed, and presence of suitable species of fungus and of appropriate pollinator species (Gecy 1994, Hettinger 1994).

The first colony of Ute ladies'-tresses in the Provo River drainage was identified in August of 1993 (Johnson 1993). Plants were located in the northern portion of Heber Valley in a riparian area near the Provo River. A second colony was discovered in 1994 near the original location in two small side-channels. Two additional colonies were located near the original two locations in 1997. Two other colonies were located downstream from this site, also in 1997. All colonies observed in 1997 consisted of two to ten plants. All were located in vernal oxbows. The source of water in these wetlands is most likely groundwater during the summer, with additional floodwater input during the spring. Based on extensive searches in 1993, 1994 and 1997, only the above-mentioned six locations are thought to be occupied by Ute ladies'-tresses in the Project Area.

Small pockets of optimal habitat may occur in many types of wetland habitat in Heber Valley. Most riparian wetlands, except for monospecific (single or one species) stands of cattails or bulrushes, deeply inundated areas and highly disturbed sites, have potential to provide habitat for Ute ladies'-tresses. Areas with the highest potential for occurrence or recruitment are near the colony found in 1993.

These high-potential areas include riparian wetlands along the northern portions of the Provo River and Snake Creek (the southern portions are considered to have moderate potential). Other wetlands in the valley, including all canal-side wetlands, have low potential. The North Fields area contains extensive wetland areas that could provide habitat for Ute ladies'-tresses, but the potential for occurrence or recruitment is low because of intensive summer grazing and other agricultural practices.

3.7.5.4 Spotted Frog

Spotted frogs are typically found in cool, clear, spring-fed water with organic substrate, anywhere from sea level to 10,000 feet in elevation. They inhabit pooled areas containing a variety of emergent, floating and submergent vegetation, and are thought to hibernate in pools that have at least one meter depth, contain abundant organic substrate, and do not completely freeze. They deposit their eggs in shallow water, typically within 2 meters of the shoreline. Other conditions found in egg deposition areas include substrates of organics, silt and clay, and water temperatures of 52 to 59°F. The spotted frog preys on insects and a few kinds of mollusks, crustaceans and arachnids (Dumas 1966, Morris and Tanner 1969, Spahr et al. 1991, Ross et al. 1993, Ross et al. 1994).

Spotted frogs have a restricted distribution in Utah with the largest population occurring in the Utah west desert and another in the Wasatch Front. The largest population of the Wasatch Front is in Heber Valley. Known locations of spotted frogs in the impact area of influence are concentrated downstream of Jordanelle Dam with a few occurrences directly north of Deer Creek Reservoir. A total of 461 egg masses were detected in a 1997 survey by UDWR in the general area of the Provo River corridor. Juvenile and adult frogs were found primarily in wetlands containing emergent vegetation and open water; other wetland types were rarely occupied.

Most habitats where spotted frogs have been found are characterized by ponds with a variety of emergent vegetation such as cattail, sedge, watercress and muskgrass. The ponds are typically supported by springs, seeps, artificial water sources as in the case of the USBR Mitigation Wetlands, and backwater areas of streams such as those created by beaver activity. Spotted frogs are negatively affected by the presence of predatory exotic fish, such as brown trout, and are likely to suffer increased mortality where they are forced to coexist directly with these species. Therefore, the suitability of wetlands for frogs may depend partly on the absence of exotic fish as is the case in the beaver pond complex in the north end of Reach 7. However, in Condie Pond (Reach 8) the frogs breed in habitats that are less suitable for trout and that are cut off from the open water portion of the pond by cattail fringe. Negative interactions of spotted frogs with other amphibians that occur in the Project Area are not known.

3.7.6 Impact Analysis

3.7.6.1 Evaluation Criteria

The evaluation criteria followed guidelines established in the ESA, and are the same for all T&E species in the impact area of influence. The following types of impacts on T&E species were considered adverse:

- Taking of T&E species
- Loss of habitat that exceeds the estimated level necessary to maintain viable populations of each species
- Actions that lead to long-term disturbance to species migration and dispersal, breeding behavior, or pollination which would threaten the viability of the population

The following types of impacts on T&E species were considered beneficial:

- Expansion and creation of suitable habitats for T&E species

3.7.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential impacts raised during scoping were eliminated from further analysis.

3.7.6.3 Proposed Action (Riverine Habitat Restoration)

3.7.6.3.1 Peregrine Falcon. Habitat for peregrine falcons in the impact area of influence consists of

areas that attract concentrations of prey, including moist meadow, wet meadow and emergent marsh wetland types. Temporary and long-term direct impacts of habitat loss would occur in all river reaches except Reach 1 (see Map 3-1 in Section 3.1.1.1). Direct, temporary impacts on peregrine falcons would include removal of 24.3 acres of foraging habitat during construction of project features (see Table 3-10 in Section 3.4.6.3.6). These losses would be temporary, lasting two growing seasons until the area is sufficiently revegetated. Construction of the new channel and flood dikes and filling for floodplain development would cause direct, permanent impacts, including the loss of 62.3 acres of foraging habitat (see Table 3-11 in Section 3.4.6.3.6). Some of these long-term habitat losses would be fully replaced under project benefits and wetland restoration.

Beneficial impacts of the Proposed Action would consist of creation, enhancement and protection of 83.4 acres of wet meadow and emergent marsh foraging habitat in all river reaches except Reach 1. These beneficial impacts would result from protection and enhancement of a 64.7-acre parcel of land situated along the Provo River in Reaches 7 and 8, which has been acquired by the Mitigation Commission in partial fulfillment of angler access requirements and habitat preservation objectives, plus created habitat shown in Table 3-12 in Section 3.4.6.3.6. The 64.7-acre parcel consists of wet and moist meadow and emergent marsh wetlands that were grazed by livestock under previous ownership. The gain in habitat would offset the direct losses caused by construction, resulting in a net increase of 21.1 acres of habitat. However, impacts would be minimal because of the infrequent and temporary occurrence of peregrine falcons in Heber Valley.

3.7.6.3.2 Bald Eagle. The Proposed Action would result in the direct and permanent removal of 973 cottonwood trees and 13.3 acres of riparian woodland that currently provide suitable roosting and perching habitat for bald eagles or would potentially develop into such habitat. The loss of habitat would occur in all stream reaches, except Reach 1, during construction of the new channel and flood dike and filling for floodplain development. Habitat losses would be offset by the restoration of the riparian corridor. Replacement of habitat would take 15 to 30 years for trees to reach a suitable size for roosting. Although a temporary loss of roosting habitat would be detrimental, the impact on bald eagles would be minimal because the Provo River does not support large winter concentrations of bald eagles and few eagles have been reported within the Project Area in the past.

Restoration of a larger and healthier riparian corridor and an increase in fish populations upon completion of the Proposed Action would have long-term benefits for bald eagles. About 251.0 acres of riparian woodland would be developed along the banks of the new channel and in the two-year floodplain in all stream reaches except Reach 1. This would offset the loss of habitat caused by construction, resulting in a net increase in habitat of 237.7 acres.

Construction between November and March would potentially result in temporary and indirect disturbance to roosting individuals. Although it is unlikely that construction would result in a taking of individuals, it could cause temporary relocation of roost sites into adjacent riparian habitat. Bald eagles would likely return to these areas to roost following completion of construction, either in the same season or during the following winter. Disturbance could occur in all stream reaches except Reach 1.

3.7.6.3.3 Ute Ladies'-tresses. The Proposed Action would permanently remove about 79.5 acres of potential but currently marginal and unoccupied habitat for Ute ladies'-tresses. These losses would occur in all types of wetlands except open water in Reaches 2-9 during construction of the new channel and flood dike and filling for floodplain development (see Table 3-11 in Section 3.4.6.3.6). The loss of this wetland habitat would be offset by restoration of the riparian corridor. Ute ladies'-tresses also would be affected by the direct but temporary removal of about 28.2 acres of marginal wetland habitat during construction of the project features (see Table 3-10 in Section 3.4.6.3.6). These losses would be temporary, lasting two growing seasons until the area is sufficiently restored. Marginal habitats are not considered important to the continued survival of the species because these areas are common throughout Heber Valley. The temporary loss of habitat would be fully replaced by implementing wetland SOPs. The six known colonies in Heber Valley would not be directly impacted by the Proposed Action. During construction, the areas in which the colonies have been reported, will be fenced off and excluded from all construction activities.

Over the long-term, the six known colonies of Ute ladies'-tresses in Heber Valley could potentially be indirectly impacted by disruption of the water source, changes in disturbance regime and encroachment of shrubs near the colonies. Possible impacts include possible loss of individual plants, reduced reproduction and diminished viability of the population. However, restoration of the river under the Proposed Action would include the re-establishment of similar variable flow regimes as those under which Ute ladies'-tress naturally occur. This would facilitate natural succession of the riparian vegetation and new suitable Ute ladies'-tresses habitats would be continually created and maintained by fluvial processes of the riverine system.

Therefore, the Proposed Action would have long-term beneficial impacts on Ute ladies'-tresses by improving habitat types throughout the river corridor that the species appears to prefer. This would include development of 279.3 acres of wetland habitat (see Table 3-12 in section 3.4.6.3.6). The gain in habitat would offset the permanent loss of habitat from construction, resulting in a net increase of 199.8 acres of habitat.

3.7.6.3.4 Spotted Frog. The Proposed Action would have direct short-term adverse impacts on spotted frogs and their habitat which would largely be mitigated by habitat restoration and spotted frog removal from the construction zone prior to construction of a given reach (see SOPs in Section 1.9.6.1 and mitigation measures in Section 3.19.3.2). Most known spotted frog locations that would be impacted are in Reaches 7, 8 and 9 (see Map 3-1 in Section 3.1.1.1). Direct, long-term impacts would include the permanent loss of 62.3 acres of emergent marsh and wet/moist meadow habitat from construction of the new channel and flood dikes and the filling of areas for floodplain development. These habitat losses would be offset by restoration of the riparian corridor and the construction of wetlands outside the Core Area prior to restoration of the river, as well as creation of oxbow-type wetlands during river restoration in the Core Area. Also, the Proposed Action has been revised to follow the recommendations of the Spotted Frog Advisory Team for the PRRP (see Appendix H). These recommendations resulted in the relocation of the proposed main channel realignment to the existing river corridor in Reaches 7 and 8 to largely protect highly valuable habitats west of the river from construction impacts. During the short-term, 24.3 acres of similar types of habitat would be temporarily removed during construction of project features. These temporary losses would last two years until the vegetation has been restored. Habitats that would be impacted are either known to be occupied by spotted frogs or have a high potential for occupation. Indirect losses of habitat would be fully restored by implementation of wetland SOPs. Adjustments would be made during the final design to include habitat features in several wetland designs to improve their suitability for spotted frogs, thus further minimizing adverse impacts and producing a net gain of wetland habitats available to the frogs. Also, wetland restoration for the Proposed Action would be designed with an emphasis on creating a diversity of habitats, which should not only make them suitable for a variety of native organisms, but may also provide predator escape opportunities for spotted frogs. The Utah Division of Wildlife Resources and other participants of the Bonneville Basin Conservation and Recovery Team will be asked to participate in final design to assure habitat needs of spotted frogs are considered. Therefore, the long-term impacts of the Proposed Action should be beneficial to spotted frogs.

Other potential direct impacts include injury of individual frogs by maneuvering equipment in occupied areas during construction. This potential will be reduced by the SOPs to be followed during construction (see Section 1.9.6.1).

Indirect impacts would result from the temporary removal of surrounding vegetation and disturbance to soils in and adjacent to occupied spotted frog habitat during construction. The impacts would potentially consist of drying or freezing of egg masses and tadpoles because of changes in water levels; changes in water quality, temperature, and/or sediment levels resulting in a loss in viability of individuals; changes in vegetation composition and decreased availability of food sources and protective areas; and disturbances of breeding adults, resulting in reduced reproductive success or displacement. Indirect impacts would last two growing seasons, until disturbed areas are sufficiently restored (see Section 3.19.3.2).

The level and type of impact on spotted frogs would depend on the timing of construction. Impacts on the various life stages would generally occur on the following time-frame:

- Adult spotted frogs are present year-round. Construction between mid-March and late April would disrupt breeding individuals. Between mid-October and mid-March, adults typically hibernate in the same areas and would not be able to escape from construction equipment.

- Egg masses are present between mid-March and mid-May.

- Tadpoles emerge beginning in early April and may not complete metamorphosis until mid-October. However, the majority of tadpoles appear to complete the transformation by late August.

The current viability of the Wasatch Front population is in question because of low population numbers and fragmentation of habitat. All temporarily disturbed habitat would be replaced as part of wetland restoration under the SOPs in Section 1.9.6.1 of Chapter 1. Other mitigation and conservation measures would be implemented to minimize and/or avoid mortality and reduced reproductive success (see Section 3.19.3.2).

The Proposed Action would have long-term benefits on spotted frogs by creating and enhancing habitat throughout the Provo River corridor. About 90.4 acres of open water, emergent marsh and wet/moist meadow would be created and enhanced by restoring natural functions to the riparian corridor. This gain in habitat would offset direct losses, thereby resulting in a net increase of 28.1 acres of habitat. The Proposed Action would ultimately contribute to the conservation of the species by increasing its distribution and density and securing its habitats.

3.7.6.3.5 Impact Summary. Table 3-32 summarizes potential impacts of the Proposed Action on T&E species.

3.7.6.4 Existing Channel Modification Alternative

3.7.6.4.1 Peregrine Falcon. Habitat for peregrine falcon in the impact area of influence consists of areas that attract concentrations of prey including moist meadow, wet meadow, emergent marsh, and open water wetland types. This alternative would result in direct short-term impacts on peregrine falcons, including the temporary removal of 100.9 acres of foraging habitat during construction of the project features (see Table 3-10 in Section 3.4.6.4.4). These impacts would last two growing seasons until the area is sufficiently revegetated as required by wetland SOPs. Direct and long-term losses include 22.9 acres of habitat in all reaches except Reaches 1 and 4 (see Table 3-11 in Section 3.4.6.4.4). These impacts would result from floodplain grading and placement of fill material in wet/moist meadow areas for construction of new flood dikes. Adverse impacts would be minimal because of the infrequent and temporary occurrence of peregrine falcons in Heber Valley.

3.7.6.4.2 Bald Eagle. Long-term, indirect impacts on bald eagles under the this alternative would include removal of 1,080 cottonwood trees and 37.6 acres of riparian woodland that currently provide suitable roosting and perching habitat or would potentially develop into such habitat. These permanent impacts would be caused by removal of existing dikes in all stream reaches except Reaches 1 and 5. About 141.9 acres of riparian woodland would be developed adjacent to the river channel under this alternative. Development of the riparian woodlands into stands that would provide habitat would take 15 to 30 years. These habitat benefits under the Existing Channel Modification Alternative would offset the adverse impacts from removal of cottonwood trees and riparian woodland, resulting in a net increase of 104.3 acres of habitat.

Temporary and localized disturbance of bald eagles during construction would have minimal impact on bald eagles for reasons described in Section 3.7.6.3.2. The Existing Channel Modification Alternative would have long-term benefits on bald eagles by increasing fish populations upon completion of the PRRP.

3.7.6.4.3 Ute Ladies'-tresses. Ute ladies'-tresses would be impacted by the temporary removal of 116.8 acres of marginal habitat during construction of project features (see Table 3-14 in Section 3.4.6.4.4). This habitat is not known to be occupied by Ute ladies'-tresses. The losses would be temporary, lasting two growing seasons until the areas are restored. There is potential for portions of this area to be developed into riparian woodland overstory, rather than wet/moist meadows used as agricultural land. This alternative would result in permanent removal of 63.1 acres of marginal habitat for Ute ladies'-tresses. In particular, wet/moist meadow and riparian woodland habitats

Table 3-32
Summary of T&E Species Impacts Under the Proposed Action and Alternatives

Alternative	Type of Potential Impact	Peregrine falcon[1]	Bald eagle[1]	Ute ladies'-tresses	Spotted frog
Proposed Action (Riverine Habitat Restoration)	Taking	No	No	No	Yes
	Temporary increased stress, displacement, or reduced reproductive success	No	Yes	Yes	Yes
	Loss or degradation of habitat *before* conservation[2]	24.3 acres	None	28.2 acres	24.3 acres
	Loss or degradation of habitat *after* conservation[3]	62.3 acres	973 mature trees 13.3 acres	79.5 acres	62.3 acres
	Beneficial impacts	83.4 acres	251.0 acres, restoration of Provo River riparian corridor	279.3 acres	90.4 acres
	Net change	Gain of 21.1 acres	Gain of 237.7 acres of habitat, beneficial impacts of river restoration	Gain of 199.8 acres	Gain of 28.1 acres
Existing Channel Modification Alternative	Taking	No	No	No	Yes
	Temporary increased stress, displacement, or reduced reproductive success	No	Yes	Yes	Yes
	Loss or degradation of habitat *before* conservation[2]	100.9 acres	None	116.8 acres	100.9 acres
	Loss or degradation of habitat *after* conservation[3]	22.9 acres	1,080 mature trees 37.6 acres	63.1 acres	22.9 acres
	Beneficial impacts	None	141.9 acres, modification of Provo River	141.9 acres	None
	Net change	Loss of 22.9 acres	Gain of 104.3 acres of habitat, beneficial impacts of river restoration	Gain of 78.8 acres	Loss of 22.9 acres

Table 3-32
Summary of T&E Species Impacts Under the Proposed Action and Alternatives

Alternative	Type of Potential Impact	Peregrine falcon[1]	Bald eagle[1]	Ute ladies'-tresses[1]	Spotted frog
Instream Structures Alternative	Taking	No	No	No	No
	Temporary increased stress, displacement, or reduced reproductive success	No	No	No	No
	Loss or degradation of habitat *before* conservation[2]	None	None	None	None
	Loss or degradation of habitat *after* conservation[3]	None	None	None	None
	Beneficial impacts	None	Prey habitat improvement in Provo River	None	None
	Net change	None	None	None	None

Notes:

[1]Impacts would be minimal and would not be considered to affect viability of the populations
[2]Impacts on habitat would be direct and temporary until conservation is fully implemented. All habitat loss would be offset by wetland standard operating procedures
[3]Impacts would be indirect and long-term, occurring after the Proposed Action or alternatives are fully implemented

would be directly and permanently impacted in all stream reaches except Reaches 1 and 5 (see Table 3-15 in Section 3.4.6.4.4). Vegetation would be removed by floodplain grading, placement of fill material and removal of existing dikes. These permanent losses would be offset by the development of additional habitat. This alternative may reduce the viability of Ute ladies'-tress habitat in the long-term by locking the river channel in place and restricting the dynamic movements of the fluvial system to a confined floodplain. Marginal habitats are not considered important to the continued survival of the species because these areas are common throughout Heber Valley. The known colonies in Heber Valley would not be directly impacted by the Existing Channel Modification Alternative.

A total of 141.9 acres of riparian woodland habitat would be expected to develop naturally along the bank of the new channel in all reaches except Reaches 1 and 4 (see Table 3-16 in Section 3.4.6.4.4). The riparian woodlands would potentially provide habitat for Ute ladies'-tresses. The gain in habitat would offset the permanent losses from construction, resulting in a net increase of 78.8 acres of Ute ladies'-tresses habitat.

Indirect impacts of the Existing Channel Modification Alternative would be the same as those described for the Proposed Action in Section 3.7.6.3.3. Known colonies would be protected during construction as part of the SOPs.

3.7.6.4.4 Spotted Frog. This alternative would have adverse impacts on spotted frogs and their habitat in Reaches 7, 8 and 9. Direct, long-term impacts would include the permanent loss of 22.9 acres of wet/moist meadow habitat from construction of the new channel and flood dikes and the filling of areas for floodplain development (see Table 3-15 in Section 3.4.6.4.4). This habitat would not be replaced under the Existing Channel Modification Alternative. During the short-term, construction of project features would temporarily disturb 100.9 acres of spotted frog habitat (see Table 3-14 in Section 3.4.6.4.4), which would be restored under the wetland SOPs described in Chapter 1, Section 1.9.6.1. A portion of this 100.9 acres may be restored as riparian woodland habitat. Habitat that would be impacted is either known to be occupied by spotted frogs or has high potential for occupation.

Other direct impacts include the potential crushing of individual frogs by maneuvering equipment in occupied areas during construction.

Indirect impacts would result from the temporary removal of surrounding vegetation and disturbance to soils in and adjacent to occupied spotted frog habitat during construction. The impacts would potentially consist of drying or freezing of egg masses and tadpoles because of changes in water levels; changes in water quality, temperature, and/or sediment levels resulting in a loss in viability of individuals; changes in vegetation composition and decreased availability of food sources and protective areas; and disturbances of breeding adults, resulting in reduced reproductive success or displacement. Indirect impacts would last two growing seasons, until disturbed areas are sufficiently restored (see Section 3.19.3.2).

The level and type of impact on spotted frogs would depend on the timing of construction. Impacts on the various life stages would generally occur on the following time-frame:

- Adult spotted frogs are present year-round. Construction between mid-March and late April would disrupt breeding individuals. Between mid-October and mid-March, adults typically hibernate in the same areas and would not be able to escape from construction equipment.

- Egg masses are present between mid-March and mid-May.

- Tadpoles emerge beginning in early April and may not complete metamorphosis until mid-October. However, the majority of tadpoles appear to complete the transformation by late August.

All temporarily disturbed habitat would be replaced as part of wetland restoration under the SOPs in Section 1.9.6.1 of Chapter 1. Other conservation measures would be necessary to minimize and/or avoid mortality and reduced reproductive success (see Section 3.19.3.2). The level of impacts would threaten the already questionable viability of the population of spotted frogs in Heber Valley.

3.7.6.4.5 Impact Summary. Table 3-32 summarizes potential impacts of the Existing Channel Modification Alternative on T&E species.

3.7.6.5 *Instream Structures Alternative*

3.7.6.5.1 Peregrine Falcon. Peregrine falcons would not be affected by the Instream Structures Alternative because habitat would not be altered or removed.

3.7.6.5.2 Bald Eagle. This alternative would have beneficial impacts on bald eagles because of increased fish populations in the Provo River. Higher densities of prey would especially benefit bald eagles that winter along the corridor. Construction activities associated with placement of the instream structures would be localized and would not disturb bald eagles.

3.7.6.5.3 Ute Ladies'-tresses. Ute ladies'-tresses would not be affected by this alternative because construction activities would be conducted primarily in the river channel away from areas of known occurrence.

3.7.6.5.4 Spotted Frog. Spotted frogs would not be affected by this alternative because construction would be conducted primarily in the river channel. Required areas of disturbance for material stockpiles would be carefully selected to avoid impacts on existing habitat.

3.7.6.5.5 Impact Summary. Table 3-32 summarizes potential impacts of the Instream Structures Alternative on T&E species.

3.7.6.6 *No Action Alternative*

The No Action Alternative would have no impacts on peregrine falcons, bald eagles, Ute ladies'-tresses, spotted frogs or their habitat. Baseline conditions would continue as described in Section 3.7.5.

3.8 Soil Resources

3.8.1 Introduction

The soil resources analysis addresses potential impacts on soil resources from the construction and maintenance of the PRRP Proposed Action and alternatives. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.7. The following soil resources impact topics are addressed in the impact analysis:

- Soil erosion and stability
- Soil quality

3.8.2 Issues Eliminated From Further Analysis

None of the soil-related issues raised during scoping and defined in Section 3.8.3 have been eliminated from further analysis.

3.8.3 Issues Addressed in the Impact Analysis

The following issues were raised in scoping and are addressed in the soil impact analysis:

- What impacts would stabilization or realignment of the Provo River have on soils?

- How would soil quality and productivity change in areas affected by the PRRP?

- Would land reclaimed by filling the old river channel under the Proposed Action be covered with enough topsoil and be of sufficient quality to conduct farming activities?

3.8.4 Description of Impact Area of Influence

The impact area of influence consists of lands in, and immediately adjacent to, the Provo River corridor that would be impacted by the PRRP. The corridor extends 1,500 feet east and west from the centerline of the river. Map 3-1 in Section 3.1.1.1 shows the direct impact area of influence.

3.8.5 Affected Environment (Baseline Conditions)

Soils in the vicinity of the Provo River are those of the Kovich, Fluventic Haploborolls, and Crooked Creek association, which consist of moderately well-drained to poorly drained, deep soils formed in mixed alluvium on floodplains, low stream terraces and valley bottoms. These soils occur primarily on Heber Valley bottom lands associated with Snake Creek and the Provo River.

3.8.6 Impact Analysis

3.8.6.1 Significance Criteria

Potential soil erosion and stability impacts were considered significant if they would prevent successful soil restoration and recovery to near pre-construction conditions within five years. The significance of potential erosion impacts on water quality is addressed in Section 3.3, Water Quality.

The potential impacts on soil resource quality are defined in this section. The related significance criteria are discussed in Section 3.11 where they are used by the agriculture discipline to help determine the significance of impacts on soil productivity.

3.8.6.2 Potential Impacts Eliminated From Further Analysis

The following potential impact was eliminated from further consideration:

- Would land reclaimed by filling the old river channel under the Proposed Action be covered with enough topsoil and be of sufficient quality to conduct farming activities?

The former river channel would be used for wetland and other riparian habitat purposes. Therefore, reclamation of soil resources for agriculture would not occur in the old river channel.

3.8.6.3 Proposed Action (Riverine Habitat Restoration)

3.8.6.3.1 Soil Erosion and Stability During Construction. Project construction activities would likely lead to a small increase in erosion of the Provo River stream bottom and bank during and immediately after construction. This impact is expected to be minor since the terrain is nearly level and the Proposed Action construction procedures would prevent significant levels of erosion. Construction procedures would include installation of temporary diversion dikes, interceptor ditches, sediment traps and detention basins as described in Section 1.5.4 of Chapter 1.

3.8.6.3.2 Soil Erosion and Stability After Construction. After construction, streambank erosion levels would be reduced by lower flow velocities and project improvements such as streambank stabilization and increased riparian vegetation.

3.8.6.3.3 Soil Quality. The Proposed Action is not expected to change baseline soil quality in the impact area of influence. Since construction activities would largely be confined to the existing river channel and adjacent areas in the construction easement, there would be little potential for impacts on soil quality of adjacent lands outside the river corridor. The setback dikes along the edge of the 100-year floodplain would be graded to blend with the existing fields and would be constructed and revegetated to near pre-construction conditions. The use of the erosion control SOPs (as defined in Section 1.9.6.1 of Chapter 1) also would help restore soils to pre-construction conditions.

Results of the groundwater analysis (see Section 3.2) indicate the Proposed Action would have only a minor effect on groundwater elevations under adjacent agricultural lands. This change would not cause significant impacts on physical and chemical conditions of the soil because the groundwater table elevation would be essentially the same as baseline conditions.

3.8.6.3.4 Impact Summary. Construction activities would cause a minor and gradual increase in streambank and streambed erosion during and immediately after construction. The Proposed Action would result in a long-term reduction in erosion. Minor changes in groundwater elevations under adjacent lands are not expected to affect soil quality. None of these impacts are expected to be significant.

3.8.6.4 Existing Channel Modification Alternative

3.8.6.4.1 Soil Erosion and Stability During Construction. Adverse soil erosion and stability impacts during and immediately after construction would be avoided and minimized by using appropriate construction procedures and SOPs described in Section 1.9.6.1 of Chapter 1. Coffer dams would be constructed in the middle of the river parallel to the direction of stream flow. Streamflows then would be gradually introduced into each section after construction is completed. The stream bottom and banks would be stabilized and sediment removed before breaching the coffer dams

to minimize increases in erosion. No significant soil erosion or stability impacts would occur.

3.8.6.4.2 Soil Erosion and Stability After Construction. This alternative would result in a short-term reduction in riparian vegetation. However, improvements associated with this alternative would result in a long-term increase in riparian vegetation and a reduction in streambed erosion. Releases from Jordanelle Reservoir and Provo River streamflows would be managed during the first 5 years after construction is completed to facilitate the re-establishment of riparian vegetation.

3.8.6.4.3 Soil Quality. Adverse impacts on soil quality are not expected for the same reasons defined in Section 3.8.6.3.3.

3.8.6.4.4 Impact Summary. The potential impacts of this alternative on soil resources would essentially be the same as those described for the Proposed Action in Section 3.8.6.3.4. The potential streambank and streambed erosion impacts of this alternative would be about the same as the Proposed Action during and immediately after construction. There also would be a reduction in long-term streambed erosion. None of the adverse impacts would be significant.

3.8.6.5 Instream Structures Alternative

3.8.6.5.1 Soil Erosion and Stability During Construction. Adverse soil erosion and stability impacts during and immediately after construction would be minor, minimized and avoided when possible using appropriate construction procedures and SOPs. Since this alternative would not include modifications to the Provo River channel, potential impacts would be less than those from the Proposed Action or Existing Channel Modification Alternative. No significant soil erosion or stability impacts would occur.

3.8.6.5.2 Soil Erosion and Stability After Construction. Habitat improvements included in this alternative would slightly reduce streambank and streambed erosion. However, these reductions are expected to be very minor because riparian vegetation along the Provo River would be about the same as baseline conditions. It would not include many flow-reducing improvements in the channel and existing erosion levels would continue.

3.8.6.5.3 Soil Quality. Adverse impacts on soil quality are not expected for the same reasons defined in Section 3.8.6.3.3.

3.8.6.5.4 Impact Summary. The potential streambank and streambed erosion impacts of this alternative would be minor during and immediately after construction and less than the other PRRP action alternatives since modification to the Provo River channel is not included in this alternative.

3.8.6.6 No Action Alternative

The No Action Alternative would have no impacts on soil resources. Baseline conditions would continue as described in Section 3.8.5 under the No Action Alternative.

3.9 Mineral and Energy Resources

3.9.1 Introduction

This analysis addresses potential impacts on mineral and energy resources from the construction and maintenance of the Proposed Action and alternatives. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.8. The following mineral and energy resources impact topics are addressed in the impact analysis:

- Existing and planned mineral resource sites in Heber Valley
- Energy used during and after construction

3.9.2 Issues Eliminated From Further Analysis

None of the mineral and energy resource issues raised during scoping and defined in Section 3.9.3 have been eliminated from further analysis.

3.9.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- Would Heber Valley mineral resources be affected by the Proposed Action and alternatives?

- What changes in energy consumption would occur during construction, operation and maintenance of the Proposed Action and alternatives?

3.9.4 Description of Impact Area of Influence

The impact area of influence for the mineral and energy resources analysis consists of existing and planned mineral resource sites in Heber Valley, construction sites along the Provo River, and roads that would be used by construction workers and recreationists attracted to the new Provo River recreation opportunities.

3.9.5 Affected Environment (Baseline Conditions)

The following mineral resource sites are situated in Heber Valley: two existing gravel mining operations in the Daniel Creek vicinity, an existing sandstone quarry in the Lake Creek vicinity, an existing private quarry near Jordanelle Dam and a potential gravel mining operation in the Lake Creek vicinity. Rock needed for borrow material during construction of the Instream Structures Alternative would come from one of these areas. Waste material created by the Proposed Action and the Existing Channel Modification Alternative would be deposited in one of these areas.

Roads where energy would be used for construction activities and that workers would use to commute to and from construction sites are identified in Section 3.18 (Transportation). Roads where additional energy would be used for angler and other recreation access to the enhanced Provo River are also identified in Section 3.18.

3.9.6 Impact Analysis

3.9.6.1 Significance Criteria

Impacts on mineral resources in Heber Valley are considered significant if 1) extraction of mineral resources would be precluded or obstructed, 2) if existing borrow supplies at mineral resource sites would not be sufficient to supply the project and new sites would have to be developed, or 3) if existing sites do not have the capacity to accept all of the spoil material and new sites have to be developed.

Energy resource impacts are considered significant if the use of energy associated with the Proposed Action and alternatives would be wasteful, i.e., if it exceeds the amount of energy typically used by projects of this type or feasible energy conservation measures are not successfully implemented.

3.9.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential mineral and energy resource impacts have been eliminated from further analysis.

3.9.6.3 Proposed Action (Riverine Habitat Restoration)

3.9.6.3.1 Mineral Resources in Heber Valley. Off-site rock material would not be needed for the Proposed Action. However, large quantities of waste material would be generated by channel excavation. As described in Chapter 1, Section 1.9.4, some of this material would be used on-site. It is expected that the remainder would be hauled to an existing large-material extraction site for later sorting and processing and use as construction material. Extraction of mineral resources would not be precluded by this waste material. The impacts of this alternative on mineral resources would not be significant based the significance criteria in Section 3.9.6.1.

3.9.6.3.2 Energy Used During and After Construction. A total of 142,600 gallons of gasoline would be used during construction the Proposed Action. Of this total, 85,600 gallons would be used by construction vehicles and 57,000 gallons would be used by workers as they commute to construction sites. After construction is completed, recreationists would use energy as they drive to the Provo River from Salt Lake City, Provo, Orem, Heber Valley and other areas.

The energy use described above is typical of these types of projects. These impacts would not be significant based on the energy significance criteria.

3.9.6.3.3 Impact Summary. Spoil material created by this alternative would be deposited at an existing excavation site. Approximately 142,600

gallons of fuel would be used during construction and some energy would be used by recreationists.

3.9.6.4 Existing Channel Modification Alternative

3.9.6.4.1 Mineral Resources in Heber Valley. No off-site rock material would be needed for this alternative. However, large quantities of waste material would be generated by channel excavation, as described in Section 1.9.4, while some would be used on-site. It is expected that the remainder would be hauled to the gravel extraction site in the Daniel Creek vicinity, for later sorting and processing and use as construction material. Extraction of mineral resources would not be precluded by this waste material. The impacts of this alternative on mineral resources would not be significant based the significance criteria in Section 3.9.6.1.

3.9.6.4.2 Energy Used During and After Construction. A total of 106,300 gallons of gasoline would be used during construction of this alternative. Of this total, 58,300 gallons of gasoline would be used by construction vehicles and 48,000 gallons would be used by workers commuting to construction sites. After construction is completed, recreationists would use energy as they drive to the Provo River from Salt Lake City, Provo, Orem, Heber Valley and other areas.

The energy use described above is typical of these types of projects. These impacts would not be significant based on the energy significance criteria in Section 3.9.6.1.

3.9.6.4.3 Impact Summary. Spoil material created by this alternative would be deposited at an existing excavation site. Approximately 106,300 gallons of fuel would be used during construction, and some energy would be used by recreationists.

3.9.6.5 Instream Structures Alternative

3.9.6.5.1 Mineral Resources in Heber Valley. This alternative would require 13,106 cubic yards of off-site rock borrow material (see Table 1-16 in Section 1.9.4 of Chapter 1), which would be extracted from an existing site. No spoil material would be created by this alternative. Construction and recreation traffic generated by this alternative would not preclude the extraction of minerals from any existing or planned mineral resource sites in Heber Valley. These impacts would not be significant based on the mineral resource significance criteria in Section 3.9.6.1.

3.9.6.5.2 Energy Used During and After Construction. A total of 4,000 gallons of gasoline would be used during construction of this alternative. Of that total, 1,300 gallons would be used by construction vehicles and 2,700 gallons would be used by workers commuting to construction sites. After construction is completed, recreationists would use energy as they drive to the Provo River from Salt Lake City, Provo, Orem, Heber Valley and other areas.

The energy use described above is typical of these types of projects. These impacts would not be significant based on the mineral resource significance criteria in Section 3.9.6.1.

3.9.6.5.3 Impact Summary. Spoil material created by this alternative would be deposited at an existing excavation site. Approximately 4,000 gallons of fuel would be used during construction, and some energy would be used by recreationists

3.9.6.6 No Action Alternative

The No Action Alternative would have no impacts on mineral and energy resources. Baseline conditions would continue as described in Section 3.9.5 under the No Action Alternative.

3.10 Air Quality

3.10.1 Introduction

The air quality analysis addresses potential impacts on air quality from the construction and maintenance of the Proposed Action and alternatives. The methodology used to conduct the air quality analysis is described in Appendix B, Section B.2.9. The following topics are included in the impact analysis:

- Vehicles emissions during construction
- Emissions from recreation traffic
- Dust emitted from construction procedures and agricultural practices

3.10.2 Issues Eliminated From Further Analysis

None of the air quality issues raised during scoping were eliminated from further analysis.

3.10.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the air quality impact analysis:

- What effects would the Proposed Action and alternatives have on air quality during construction?
- What effects would increased recreational use of the Provo River have on air quality?
- Would the agricultural impacts of the PRRP affect air quality?

3.10.4 Description of Impact Area of Influence

The air quality impact area of influence includes areas along the Provo River between Jordanelle and Deer Creek reservoirs where the Proposed Action and alternatives would be constructed and roads that would be used by construction or recreation traffic (primarily Highways 40, 113 and 189 and River Road). Map 3-1 in Section 3.1.1.1 shows the direct impact of influence.

3.10.5 Affected Environment (Baseline Conditions)

Baseline conditions used for the air quality analysis are the same as existing conditions. Although air quality data have not been collected in Heber Valley, the valley's air quality usually is excellent. This has led to the designation of Heber Valley as a Class II attainment area, subjecting it to National Prevention of Significant Deterioration of Air Quality standards. These standards are designed to prevent deterioration of air quality in attainment areas (areas where the federal government has chosen to prevent degradation of excellent air quality). The primary types of emissions in Heber Valley under baseline conditions are nitrogen oxides (NOx), sulfur oxides (SOx), particulate matter (measured as PM10 or particles less than 10 microns in diameter) from vehicles, smoke from fireplaces, wood stoves and agricultural burning; and dust from the tilling of agricultural fields. These emissions are considered pollutants and are by-products of combustion except for dust caused by wind erosion of soil. Inversion layers occasionally trap these pollutants in the valley when certain climatic conditions exist, usually in the winter.

3.10.6 Impact Analysis

3.10.6.1 Significance Criteria

The Utah Air Conservation Rules (UACRs) identify Wasatch County as a Class II attainment area. The impact area of influence is thus subject to National Prevention of Significant Deterioration of Air Quality standards. The State of Utah has set limits on the maximum allowable increase in pollutant concentrations, which vary by the class (I, II, or III) of the attainment area designation. Class I attainment areas are generally national parks, monuments, wilderness, wild and scenic rivers and other similar areas where protection of air quality is a high priority. Class II attainment areas allow greater concentrations of pollutants than Class I attainment areas, but still have scenic features that required protection of air quality. Class II attainment areas allow the greatest increase in concentrations of pollutants. The air quality significance criteria are based on the limits on the maximum allowable increase as defined by the UACRs.

Air quality impacts of the Proposed Action and alternatives would be significant if the applicable air quality standards would be violated. The Proposed Action and alternatives would violate the standards if they emit more than 250 tons of NOx, SOx or particulates in any 12-month period of construction. Particulates include dust emissions and pollutants emitted from the burning of fuel, especially diesel fuel burned by large trucks and other vehicles. These standards only apply to direct air quality impacts of projects, which include emissions from construction traffic and operation of construction equipment. Indirect impacts would include emissions from traffic induced by new recreation opportunity.

3.10.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential air quality impacts of the PRRP have been eliminated from further analysis.

3.10.6.3 Proposed Action (Riverine Habitat Restoration)

3.10.6.3.1 Vehicle Emissions During Construction. The Proposed Action would increase vehicle emissions in Heber Valley during construction. Table 3-33 shows the maximum vehicle emissions during any 12-month period of construction, including worst-case estimates that assume equipment would operate through all normal working hours during construction. None of these air quality impacts would be significant because they are well below the 250-ton threshold included in the significance criteria.

3.10.6.3.2 Emissions From Recreation Traffic. The Proposed Action would increase recreation opportunities along the Provo River between Jordanelle and Deer Creek reservoirs. This would indirectly increase recreation traffic and vehicle emissions on roads used by recreationists (primarily Highways 40, 189, 113 and River Road). The air quality standards defined in Section 3.10.6.1 would not be violated because they only apply to direct air quality impacts of a project, such as those caused by emissions from construction vehicles.

3.10.6.3.3 Dust Emissions. Dust would become airborne during construction of the Proposed Action. However, the SOPs defined in Section 1.9.6.1 of Chapter 1 include periodic watering of equipment, spoil piles and dirt roads, which would prevent large amounts of dust from being emitted.

The Proposed Action also would remove agricultural land from production during construction (see Section 3.11, Agriculture), which also would reduce related dust emissions along the Provo River.

3.10.6.3.4 Impact Summary. The Proposed Action would increase NOx, SOx and PM10 vehicle emissions during construction and after construction as recreationists drive to the Provo River. Dust emissions would increase during construction and decrease after construction in areas where agricultural land would be removed from production.

3.10.6.4 Existing Channel Modification Alternative

3.10.6.4.1 Vehicle Emissions During Construction. Table 3-33 defines the maximum vehicle emissions during any 12-month period of constructing this alternative. None of these air quality impacts would be significant because they are well below the 250-ton threshold included in the significance criteria.

3.10.6.4.2 Emissions From Recreation Traffic. Recreation-related emissions would be the same as described for the Proposed Action in Section 3.10.6.3.2, except fewer recreationists would be attracted to the Provo River under this alternative.

3.10.6.4.3 Dust Emissions. Dust emissions would be the same as described for the Proposed Action in Section 3.10.6.3.3, except reductions in emissions after construction would be less under this alternative because it would remove much less agricultural land from production.

3.10.6.4.4 Impact Summary. The Existing Channel Modification Alternative would cause an increase in NOx, SOx and PM10 vehicle emissions during construction and after construction as recreationists drive to the Provo River. Dust emissions would increase during construction and decrease after construction in areas where agricultural land would be removed from production.

3.10.6.5 Instream Structures Alternative

3.10.6.5.1 Vehicle Emissions During Construction. Table 3-33 defines the maximum vehicle emissions during any 12-month period of constructing this alternative. None of these air quality impacts would be significant because they are well below the 250-ton threshold included in the significance criteria.

3.10.6.5.2 Emissions From Recreation Traffic. Recreation-related emissions are the same as described for the Proposed Action in Section 3.10.6.3.2, except many fewer recreationists would be attracted to the Provo River under this alternative.

3.10.6.5.3 Dust Emissions. Construction of this alternative would cause a minor increase in dust

Table 3-33
Maximum Vehicle Emissions During Any 12-Month Period of Construction
(tons)

	Nitrogen Oxides (NO_x)[a]	Sulfur Oxides (SO_x)[b]	Particulates (PM_{10})[c]
Proposed Action (Riverine Habitat Restoration)	80	17	5
Existing Channel Modification Alternative	78	7	6
Instream Structures Alternative	23	2	2

Notes:

[a]NOx is nitrogen oxides, which are pollutants from combustion
[b]SOx is sulfur oxides, which are pollutants from combustion
[c]PM_{10} or particulate matter less than 10 microns in diameter

emissions during construction, but SOPs would minimize the amount.

3.10.6.5.4 Impact Summary. This alternative would cause an increase in vehicle emissions during construction and after construction as recreationists drive to the Provo River. There also would be a minor increase in dust emissions during construction.

3.10.6.6 No Action Alternative

The air quality impacts of the Proposed Action and alternatives would not occur under the No Action Alternative. Baseline air quality conditions would continue as described in Section 3.10.5.

3.11 Agricultural Resources

3.11.1 Introduction

This analysis addresses potential impacts on agricultural resources from the construction and management of the Proposed Action and alternatives. Assumptions and impact topic analysis methods used in the analysis are explained in Appendix B, Section B.2.10. The following impact topics are addressed in the agricultural resources impact analysis:

- Livestock grazing and production
- Cropland and crop production
- Agricultural practices and operations

3.11.2 Issues Eliminated From Further Analysis

The following agricultural resources issues identified through the public scoping process were eliminated from further analysis:

- How would irrigation water be provided to both sides of the river where a farm is presently on one side of the river?

This issue was eliminated from further consideration for the reasons described previously for this issue on water resources. Refer to Section 3.2.2 of the Final EIS.

3.11.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- What impacts would the PRRP have on farming operations and landowner access that would be divided by the Proposed Action? Would river crossings be provided to access divided farmlands? What impacts would occur to livestock crossing and watering on private land under the PRRP?
- What would be the construction effects, including access for construction, on farms and ranches and how would they be minimized?
- What would be the impacts of restrictions on motorized equipment crossing the river, and how would these impacts be mitigated to accommodate existing access by farmers and ranchers?
- How would increased public access along the river affect farming activities?
- What impacts would improvement of threatened and endangered species habitats along the river have on future agricultural uses?
- How would existing agricultural access along the river be impacted by breaching of the dikes under the Proposed Action?

3.11.4 Description of Impact Area of Influence

The impact area of influence consists of agricultural lands along the Provo River corridor that would be potentially affected as a result of the Proposed Action and alternatives. It extends about 200 to 2,200 feet wide along the centerline of the Provo River between Jordanelle Dam and Deer Creek Reservoir. Map 3-1 in Section 3.1.1.1 shows the direct impact area of influence.

3.11.5 Affected Environment (Baseline Conditions)

This section defines the agricultural resources that would be affected by the Proposed Action and alternatives. These resources include irrigated pasture and grazing land that is not irrigated.

Table 3-34 summarizes acreage (the acres are those contained within the impact area of influence as defined in Section 3.11.4), average yield and productivity under baseline conditions. The cropping pattern under baseline conditions would be about 92 percent flood-irrigated pasture (361 acres) and 8 percent non-irrigated grazing land (34 acres). Under baseline conditions, total annual production would be 2,404 animal unit months (AUMs).

Under baseline conditions, establishment of the public fee title corridor would impact some farming operations along the river corridor by restricting the crossings of the river channel by livestock and motorized farm machinery. The dike roads would be closed to motorized vehicles, which would affect access by some landowners who have used the dike roads to access properties on one or both sides of the Provo River. See Section 1.4.2 for a description of the management of the river corridor under baseline conditions.

3.11.6 Impact Analysis

3.11.6.1 Significance Criteria

Since the significance of impacts on livestock and crop production is based on how such impacts would affect agricultural operations and economics, the significance of potential production impacts are defined and addressed in the Agricultural Practices and Operation section (Section 3.11.6.3.2) and Socioeconomics section of this chapter (Section 3.12).

Potential impacts on agricultural practices and operations are considered significant and adverse if the Proposed Action and alternatives would cause a long-term and substantial alteration to such practices as fertilizer and pesticide applications, cultivation practices, the location and operation of irrigation facilities and other production methods on grazing lands and croplands.

Table 3-34
Summary of Acreage, Average Yield and Productivity Under PRRP Baseline Conditions

Crop[1]	Units/Acre	Total Acreage	Average Yield/Acre	Total Production
Pasture/Crop	AUMs[2]	361	6.5	2,346
Grazing Land	AUMs	34	1.7	58

Notes:
[1]Cropland used for pasture is flood irrigated and grazing land is not irrigated.
[2]AUMs are animal unit months, the amount of forage (800 pounds dry matter) required to feed one cow and calf for one month.

3.11.6.2 Potential Impacts Eliminated From Further Analysis

The following potential impacts on agricultural resources were eliminated from further analysis because they are not expected to occur under the Proposed Action and alternatives:

- What impacts would potential increases in water table elevations have on existing farming operations adjacent to the river?

  Impacts on baseline water table elevations from the Proposed Action were found to be minor (see Section 3.2, Water Resources). The water resources analysis concluded that the Existing Channel Modification and Instream Structures alternatives would not cause any impacts on groundwater levels along the Provo River. Since impacts of the Proposed Action on baseline water table elevations do not have the potential to affect soil or agricultural resources, there would be no impacts on farming operations.

- Would land reclaimed by filling the old river channel under the Proposed Action be covered with sufficient topsoil to conduct farming activities? Could this reclaimed land be used by farmers and ranchers with adjacent property?

  Old river channel areas would be reclaimed for uses other than farming, such as riparian vegetation and wetlands.

- What opportunities would there be for ranchers and farmers along the river to maintain control of their private land and provide easements for fisherman access?

  Some agricultural land would be acquired in fee title under baseline conditions to establish a public access corridor along the Provo River. These lands would be fenced, and access would be provided for anglers (see Section 1.4.1, in Chapter 1 on implementation of baseline commitments). As described in Chapter 1, Sections 1.5.3, 1.6.3 and 1.7.3, the Project Area will be comprised of a Core Area (and for the Proposed Action only an Expanded Restoration Area). Agricultural land occurring within the Core Area and Expanded Restoration Area would be acquired, fenced and removed from agricultural use to protect and enhance wildlife habitat values. Under these management conditions, there are no remaining advantages to the landowner to retain title because the rights needed to make the PRRP function properly are inclusive.

3.11.6.3 Proposed Action (Riverine Habitat Restoration)

This section describes the impacts of the Proposed Action on agricultural production, practices and operations.

3.11.6.3.1 Livestock Grazing, Cropland and Crop Production. Impacts on livestock grazing, cropland and crop production would occur as a result of the removal of agricultural lands necessary for project implementation and management. These lands would be fenced and removed from agricultural production. They would be located either in the Core Area or in the Expanded Restoration Area. For the purposes of impact analysis, it was assumed that all the area shown on Map A-3 (in the map pocket at the back of the Final EIS) as the Expanded Restoration Area would be acquired from willing sellers. The amount of land actually acquired in the Expanded Restoration Area may be less.

Table 3-35 is a summary of acres, and AUM production losses which would occur annually from the implementation and management of the Proposed Action and alternatives. These impacts would be initiated at the start of construction of the Proposed Action and continue throughout the life of the project.

3.11.6.3.2 Agricultural Practices and Operations. Under baseline, impacts to farming operations would occur under as a result of the acquisition and establishment of a fee-title public access area along the Provo River corridor. The Proposed Action would increase the number and extent of farming operations divided by the realigned river. Crossings of the river corridor such as bridges generally would not be provided. However, where no feasible alternate access exists or could not reasonably be developed, landowners would be provided alternate access to divided properties via bridge-type facilities or else landowners would be compensated for the loss or disruption of access. The impacts to farming operations under the Proposed Action by virtue of increased or altered travel routes to access the properties would be negotiated on a case-by-case basis as part of the compensation due to the landowners. Irrigation facilities such as canals and diversions would be restored or replaced. Water deliveries would be assured in quantity and reliability as previously existed.

The Proposed Action would increase the frequency and magnitude of impacts on livestock watering and river crossings compared to baseline. Crossings of the river corridor by livestock would generally not be allowed except through or over existing bridges. Bridge-type crossings may be provided if no practicable alternate access exists or can be developed, or the lack of access would be compensated for during the negotiations for property acquisition with landowners on a case-by-case basis. Presently, few livestock operations exist that require crossing the Provo River on a frequent basis. Access to the Provo River for watering or development of alternative off-stream watering sources would be provided as negotiated with landowners on a case-by-case basis according to individual circumstances and needs.

The Proposed Action would increase the area within which motorized equipment generally would not be allowed. As previously discussed, exceptions may be negotiated on a case-by-case basis, and could involve either existing bridges or bridge-type facilities. The public access to the river corridor would be provided under baseline conditions. Increased use of the Project Area would occur under the Proposed Action. Impacts of the increased recreation use would be reduced by management actions to provide parking, trash pick-up and sanitary facilities. Access would be pedestrian only, and fencing of the Project Area would limit trespassing onto adjacent property.

Improvements in habitat for threatened or endangered species would have no significant impacts on agricultural uses. Ute ladies'-tresses habitat occurs within the active floodplain of the Provo River which will be acquired under baseline or the PRRP alternatives, and is in areas where agricultural uses currently do not occur. The bald eagle is a winter resident and/or migrant in the Project Area. Improvement of habitat for Ute ladies' tresses and bald eagle would occur under the Proposed Action and the Existing Channel Modification Alternative. Increases in bald eagle roosting habitat would occur through expansion of the riparian cottonwood forest and increases in the fish food base. Because bald eagles will be in the Project Area at a time when agriculture use is at a minimum, the increases in roosting habitat would not impact agricultural uses beyond what may have occurred without the project. The Proposed Action would increase potential foraging habitat for peregrine falcon; however the peregrine has not

Table 3- 35
Summary of Annual Loss of Agricultural Acres and Production
Proposed Action and Alternatives

	Grazing Land		Pasture Land		Totals	
	Acres	AUMs	Acres	AUMs	Acres	AUMs
PROPOSED ACTION (RIVERINE HABITAT RESTORATION)						
Baseline	34	58	361	2346	395	2404
Loss (Impact)	26	44	288	1872	314	1916
Percent Change	76.5	75.9	79.8	79.8	79.5	79.7
EXISTING CHANNEL MODIFICATION ALTERNATIVE						
Baseline	34	58	361	2346	395	2404
Loss (Impact)	0	0	8	52	8	52
Percent Change	0	0	2.2	2.2	2.0	2.2
INSTREAM STRUCTURES ALTERNATIVE						
Baseline	34	58	361	2346	395	2404
Loss (Impact)	0	0	0	0	0	0
Percent Change	0	0	0	0	0	0

been recorded in Heber Valley or in the Project Area in the recent past.

Significant impacts would occur on some individual farming enterprises, but most would not be significant because the SOPs and the permanent loss of land generally would be spread along the length of the river. Thus, the loss of land and production would be spread among multiple land owners.

3.11.6.3.3 Impact Summary. The Proposed Action would cause a total loss of 314 acres of agricultural land, and 1,916 AUMs. These impacts would begin at the start of construction of the Proposed Action and continue through out the life of the project. Impacts on agricultural practices would include modifications to irrigation systems, disruptions in grazing patterns, and changes in cultivation and local access.

3.11.6.4 Existing Channel Modification Alternative

3.11.6.4.1 Livestock Grazing, Cropland and Crop Production. This alternative would remove 8 acres of pasture land, and create an annual loss of 52 AUMs (see Table 3-35).

3.11.6.4.2 Agricultural Practices and Operations. Impacts on agricultural practices and operations would be minor. Significant impacts on agricultural practices and operations would not be expected with such a minor loss of acreage and because of the SOPs described in Section 1.9.6 of Chapter 1.

3.11.6.4.3 Impact Summary. This alternative would cause an annual loss in production of 52 AUMs. This loss would begin with the start of construction and last throughout the life of the project.

3.11.6.5 Instream Structures Alternative

This alternative would not result in the loss of any agricultural land (see Table 3-35). Any impact on agricultural practices and operations would expected to be minimal, and not significant.

3.11.6.6 No-Action Alternative

The No Action Alternative would not cause impacts on agricultural resources. The baseline conditions described in Section 3.11.5 would continue under the No Action Alternative.

3.12 Socioeconomics

3.12.1 Introduction

The socioeconomic analysis addresses potential impacts on social and economic factors during and after construction of the Proposed Action and alternatives. The focus of the analysis is on potential impacts on the retail trade, construction and farm sectors of the local economy. Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.11. The following impact topics are addressed in the analysis:

- Population
- Agricultural economics
- Gross revenue in other sectors
- Income
- Employment
- Public services and related fiscal impacts
- Housing
- Social conditions
- Growth-inducing conditions

3.12.2 Issues Eliminated From Further Analysis

None of the socioeconomic issues raised during scoping were eliminated from further analysis.

3.12.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the socioeconomic impact analysis:

- What economic impacts would occur to land owners who have their farmland segmented?

- How would the county tax base be affected by removing arable land from production to form a more sinuous river channel?

- What social, emotional, quality-of-life and economic impacts would occur to property owners along the river from people trespassing, potential loss of private land by acquisition, providing public access and an influx of people pursuing recreational activities?
- What growth-inducing impacts would the Proposed Action and alternatives have on the Heber Valley?
- What would be the socioeconomic impacts on residents of Wasatch County?
- What would be the economic impacts from repeated maintenance efforts?
- What probable economic impacts would new recreation and resource users have on Heber Valley?

3.12.4 Description of Impact Area of Influence

The socioeconomic impact area of influence includes the Provo River corridor between Jordanelle and Deer Creek reservoirs and Wasatch County. Widespread and diffuse socioeconomic impacts may occur in other areas of Wasatch County or outside the county in areas where project materials are purchased and where construction workers and recreationists live.

3.12.5 Affected Environment (Baseline Conditions)

3.12.5.1 Population

Wasatch County's population has grown significantly — more than 3.7 percent a year — since 1990. This growth has been fueled by job growth along the Wasatch Front, primarily in Salt Lake City and in the Provo/Orem area, which are within commuting distance. This transformation of Heber Valley from an area characterized by small farms to a Wasatch Front bedroom community is expected to continue. The siting of the 2002 Winter Olympic venues in Park City and Midway is expected to strengthen this trend. The county's population was assumed to increase at a 3.2 percent average annual growth rate, resulting in approximately 14,275 residents in Wasatch County by the year 2000 (State of Utah, Governor's Office of Planning and Budget 1997).

3.12.5.2 Agricultural Economics

The average farm size in Heber Valley is 17 acres; 8 percent are larger than 40 acres, and 27 percent are less than 5 acres. Many farms have been converted to "hobby" farms that are not the primary source of income for their owners. A total of 7,823 acres of farmland are in the impact area of influence. Total gross revenue from all farm enterprises that would be affected by the Proposed Action and alternatives is estimated to average $1,753,000 per year under baseline conditions.

3.12.5.3 Gross Revenue in Other Sectors

In addition to the farm sector, the retail trade sector of the local economy would be affected by the Proposed Action and alternatives. This includes businesses that would supply construction materials, fuel and other retail services to construction workers and eventually, recreationists traveling through Wasatch County on their way to the restored Provo River. Total gross revenue in all sectors of the Wasatch County economy under baseline conditions is estimated to be $126,676,393 a year.

3.12.5.4 Income

Non-farm income in Wasatch County has steadily increased since 1987, rising an average of 7.9 percent a year through 1992 (Bureau of Economic Analysis 1994). Over the same period, the county's population has increased from 8,700 in 1980 to 10,700 in 1992, an annual average of 1.7 percent (State of Utah, Governor's Office of Planning and Budget 1994). This suggests a long-term trend of increasing per-capita income. Total income in Wasatch County increased 7.7 percent in 1992 and 6.6 percent in 1993. Total income in Wasatch County under baseline conditions is estimated to be $122,054,117 in 1997.

3.12.5.5 Employment

With the exception of agriculture, employment increases are projected for all major sectors of Utah's economy. Services, non-farm proprietors, TCPU (transportation, communication, and public

utilities), trade, and FIRE (finance, insurance, and real estate) are projected to have the most rapid rates of increase (i.e., average annual rates of growth in excess of 2.0 percent in the years 1995 to 2020). Employment is projected to grow more rapidly (or in the case of agriculture decrease less rapidly) in every sector in the state than in the nation. Manufacturing employment is projected to increase in Utah while declining for the national economy. About one-third (31 percent) of all jobs created in Utah in the 1995- to-2020 period are projected to be service jobs, which is now and will continue to be the sector with the largest share of the state's employment. This compares to 46 percent at the national level. A greater share of employment will be created in trade, TCPU, manufacturing, construction, and government in the state as compared to the nation. Wasatch County is expected to have higher rates of growth of employment through the year 2020 than all but five other counties in the State. Baseline employment for Wasatch County is 7,849 jobs. (State of Utah, Governor's Office of Planning and Budget 1997).

3.12.5.6 Public Services and Related Fiscal Conditions

Public services and related fiscal conditions from 1990 to 1995 suggest an area in transition and struggling to meet the increasing needs of a growing community. This is reflected in increasing government sector employment and capital improvement programs. Wasatch County and Heber City services are characterized by staffing shortages, increasing capital programs and significant equipment replacement needs (Mountainland Association of Governments 1993a).

3.12.5.7 Housing

Baseline housing conditions are characterized by increasing housing costs and a shortage of housing, especially lower-cost homes. This is having a significant impact on low-income families (Mountainland Association of Governments 1993a and 1993c).

3.12.5.8 Social Conditions

This section describes baseline social groups and conditions that would likely be affected by the Proposed Action. These groups, consisting of individuals who would be affected in a similar manner, overlap because some people have interests and concerns that place them in more than one group. For example, a farmer may be a recreationist, conservationist or local property owner as well as the owner of a farming enterprise that would be affected by the Proposed Action and alternatives. Members within each social group would likely experience common impacts on their lifestyles, behavior, attitudes, values and general well-being.

3.12.5.8.1 Social Groups. The following social groups are addressed in this analysis and described in this section:

- Farmers and their employees
- Other local business owners and their employees
- Local residents and property owners
- Recreationists and conservationists

Farmers are prominent and influential in Heber Valley and in Wasatch County politics. Typical concerns of farmers are the productivity and economic viability of agricultural operations, protection of water supplies, and privacy in terms of personal privacy and protecting their operations from incompatible land uses. Farmers value the land, understand agriculture's place in the environment (e.g., its effects on water resources, wetlands and habitat), and often have strong feelings for freedom and self-reliance.

Wasatch County is home to many businesses such as hotels and motels, service stations, and eating and drinking establishments that generate income from residents and visitors. Local business owners are generally concerned about activities that affect their business. While some business owners still depend on agriculture, many increasingly depend on non-agricultural customers, especially local residents who work in other counties and visitors attracted to Wasatch County's natural and recreational amenities.

Local residents and property owners reflect a mixture of attitudes and interests. Both long-term residents and newcomers value the community's small size and rural character. Some may be concerned that these attributes are starting to erode and, therefore, may be more sensitive to growth and its effects than residents of larger communities or local residents who favor growth. For residents

accustomed to the smaller, more rural and more homogeneous community of the past, growth has created a perception that the quality of life and community well-being is diminishing in Heber Valley. Other Heber Valley residents value change that assures economic well-being for generations to come. This group tends to accept some loss of small-town character in exchange for economic development. Local residents as a whole value personal privacy and are protective of their property value.

Recreationists and conservationists, whether living in Wasatch County or elsewhere, are well-represented by both individuals and formal interest groups that are actively involved in water and environmental issues that concern the county. They generally support measures that promote the efficient use of and long-term protection of natural resources and some are very interested in enhancing environmental conditions and recreational opportunities in the impact area of influence.

3.12.5.8.2 Community Well-Being. Changes in indicators of Wasatch County community well-being are mixed, based on data over the past decade. Per capita personal income has grown in real terms but has remained below the state average (Bureau of Economic and Business Research 1993 and 1995). At the same time, the percentage of families below the poverty line has remained steady or declined slightly (U.S. Bureau of the Census 1983a and 1994a). The percentage of Wasatch County residents who have completed high school increased by about 7 percent, a slightly higher rate of improvement than throughout the state. Nevertheless, educational attainment in Wasatch County is still somewhat below the state as a whole (Bureau of the Census 1983b and 1994b). Change in the county's crime rate, a key factor in public perception of community well-being, has been relatively favorable over the past decade, remaining the same or declining slightly while the crime rate rose statewide (Bureau of the Census 1983c and 1994c).

3.12.5.9 Growth-Inducing Forces

To the casual observer, Heber Valley is a rural community with a relatively homogeneous culture set amid picturesque farmlands and mountains. However, two decades or more of change have established trends that are transforming the economy, demography and social character of Wasatch County. These changes have been precipitated both internally and by its dynamic neighbors, Salt Lake County, Utah County, Summit County and people moving to Heber Valley from other states. The driving forces behind growth in Wasatch County and Heber Valley are population and employment growth in the state, on the Wasatch Front and in Summit County. Good road access to jobs on the Wasatch Front and Summit County, plus the prospect for improved road access, has encouraged in-migration. Other attractive features of Wasatch County and Heber Valley are the non-metropolitan quality of life, opportunity for outdoor recreation, a lower cost of living (including housing) than in the state's metropolitan areas, growth-accommodating land-use policies, and adequate public facilities and services. These features attract retirees, seasonal and second-home owners and working households.

Growth-inducing forces have caused unprecedented housing development in Wasatch County. According to data from the Bureau of Economic and Business Research at the University of Utah, 249 permits for new single-family dwelling units were issued in 1994, compared to an average of 60 per year from 1980 to 1989 and an average of 128 per year from 1990 to 1994 (Bureau of Economic and Business Research 1990, 1993 and 1995). County planning officials foresee as many as 5,800 new single-family dwelling units will be built in Wasatch County in the next 20 years, an average of 290 per year (Noffsinger, 1995).

The types of agricultural land uses along the Provo River Project Area in Heber Valley are defined in Section 3.11. The remainder of this section provides additional information about the concerns of farmers and land owners along the Provo River, as collected during a study for USBR and UDP&R (Bear West 1993). The results of a survey in Wasatch County related to development of new recreation opportunities also are described.

Most farmers, property owners and local residents along the Provo River are generally satisfied with the Provo River as it exists today because high flows are controlled, the channel is stable and the channelized river efficiently delivers irrigation water to diversions. Although farmers and local residents have had conflicts with people trespassing, making noise, littering and causing other problems along the river, they have generally allowed river access to

serious anglers because they typically have not caused problems. Farmers and local residents are typically protective of their property, privacy and lifestyles. While many would prefer no change in the river, some land owners believe future development of some type is inevitable in the fast-growing Heber Valley. They feel their land would be worth more if it was developed for compatible uses in the future, and value change in that direction. They also are concerned about their property values and possible acquisition of private property for public use as part of the PRRP.

In a recent survey, a majority of Wasatch County residents supported continued tourism development as part of the county's economic base (CADWEST Research Consultants 1994). However, they also expressed concerns about the effects of tourism on their quality of life. For example, a majority of the property owners responding to the survey agreed that tourism growth should by managed by local government, residents' involvement in tourism decisions is important, tourism planning must take into account quality of life, and the environmental impacts of tourism are not minor.

3.12.6 Impact Analysis

3.12.6.1 Significance Criteria

3.12.6.1.1 Economic Impacts. Significant and adverse impacts on gross revenue, employment, income and fiscal conditions are defined as changes of 10 percent or more from baseline conditions. This percentage is considered by economists and planners to be a general threshold at which local government's ability to handle growth would be tenuous, and gross revenue, employment and income impacts would become significant. Population, public service and housing impacts are considered significant if the project requires services that exceed available capacity of public services or housing under baseline conditions.

3.12.6.1.2 Social Impacts. Impacts on social groups and the individuals within them are considered significant when a change substantially disrupts a group's livelihood or lifestyle, or when there is a major conflict with the group's most important values or attitudes. Impacts on a community's well-being are considered significant when they lead to polarization and conflict among social groups, or a notable and negative change in the cohesion and stability of the community.

These criteria were selected from professional literature on social impact assessment (for example, see USFS 1973, Branch et al. 1982, and Burdge 1994 and 1995). The significance of social impacts was determined using professional judgment and considering the geographic context and intensity of impacts.

3.12.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential impacts were eliminated from further analysis.

3.12.6.3 Proposed Action (Riverine Habitat Restoration)

3.12.6.3.1 Population Impacts. The Proposed Action would not increase the population of the impact area of influence because it would only cause a minor increase in permanent employment opportunities and would not induce new growth for the reasons described in Section 3.12.6.3.7.

3.12.6.3.2 Agricultural Economics Impacts The following subsections present economic impacts during and after construction.

3.12.6.3.2.1 Gross Revenue Impacts During Construction. Heber Valley encompasses about 12,800 acres of irrigated acreage. Under the Proposed Action 288 acres, or 2.25 percent of the total irrigated acreage would be permanently removed from production. This impact, along with an estimated permanent removal of 26 nonirrigated acres of grazing land would result in total annual loss of approximately $13,419 in gross revenue within the entire area affected (see Table 3-36 and 3-37). The acreage of grazing land and pasture permanently removed from construction under the Proposed Action is shown on Table 3-34. The related production losses are defined in Agricultural Resources, Section 3.11. Although this loss of revenue is minor compared to total gross revenue from grazing and pasture lands in Heber Valley (about .05%), it could cause a major impact on individual farm enterprises.

Table 3-36
Direct Economic Impacts
During Construction

	Proposed Action			Existing Channel			Instream		
	Wasatch County	Out-of-County	Total	Wasatch County	Out-of-County	Total	Wasatch County	Out-of-County	Total
Construction									
Equipment, Overhead and Profit	$547,125	$1,641,374	$2,188,499	$556,457	$1,669,370	$2,225,827	$38,658	$115,973	$154,631
Labor	$245,810	$737,429	$983,239	$250,002	$750,007	$1,000,009	$17,368	$52,104	$69,472
Retail									
Miscellaneous Materials, Gas,and Food	$4,800	$19,200	$24,000	$6,000	$24,000	$30,000	$800	$3,200	$4,000
Land Acquisition	$450,000	$4,050,000	$4,500,000	$50,000	$450,000	$500,000	$0	$0	$0
Agriculture	($13,419)	$0	($13,419)	($364)	$0	($364)	$0	$0	$0
Total	**$1,234,315**	**$6,448,003**	**$7,682,319**	**$862,095**	**$2,893,377**	**$3,755,473**	**$56,826**	**$171,277**	**$228,102**

Table 3-37
Direct Economic Impacts
After Construction

	Proposed Action			Existing Channel			Instream		
	Wasatch County	Out-of-County	Total	Wasatch County	Out-of-County	Total	Wasatch County	Out-of-County	Total
Labor									
O&M or Corridor	$37,500	$0	$37,500	$0	$0	$0	$0	$0	$0
Maintenance	$60,000	$0	$60,000	$75,000	$0	$75,000	$127,500	$0	$127,500
Retail									
Retail	$150,583	$1,355,250	$1,505,834	$47,209	$424,881	$472,090	$18,372	$165,348	$183,720
Eating and Drinking	$250,972	$250,972	$501,945	$78,682	$78,682	$157,363	$30,620	$30,620	$61,240
O&M Corridor Supplies and Materials	$7,500	$7,500	$15,000	$7,500	$7,500	$15,000	$7,500	$7,500	$15,000
Agriculture	($13,419)	$0	($13,419)	($364)	$0	($364)	$0	$0	$0
Total	**$493,137**	**$1,613,723**	**$2,106,859**	**$208,027**	**$511,063**	**$719,090**	**$183,992**	**$203,469**	**$387,461**

3.12.6.3.2.2 Gross Revenue Impacts After Construction. The total irrigated acreage permanently removed from production and associated reduction in gross revenue would be the same after construction as during construction. These impacts are addressed in section 3.12.6.3.2.1.

3.12.6.3.2.3 Production Costs. The types of impacts described in Section 3.11.6.3.2 may cause some farmers to modify their irrigation systems or farming practices. These modifications could change production costs for some farmers if irrigation systems need to be modified, transportation routes changed or cultivation practices need to be modified. The specific impacts on individual farm enterprises would vary, are difficult to measure and were not defined in this analysis. The SOPs described in Section 1.9.6.1 of Chapter 1 would help avoid adverse production cost impacts on individual farmers and land owners. Most modifications and repairs would be completed by the project during construction, or landowners would be compensated for impacts caused by the project.

3.12.6.3.3 Direct Revenue Impacts in Other Sectors. During construction, net revenue in all sectors of the economy would increase as contractors purchase materials and construction workers purchase gasoline and food. The peak annual net increase in direct revenues from all sectors of the economy is estimated to be $7,682,319 primarily as the result of equipment leases and land acquisition. The direct impact in Wasatch County is estimated to be $1,234,315. Table 3-36 shows the projected direct changes in revenue in all sectors of the economy and the estimated distribution of these impacts from within the Wasatch County economy and outside the county.

After construction, net revenue in all sectors of the economy would also increase as recreation use increases. The annual direct increase in revenues from all sectors of the economy are estimated to be $2,106,859 primarily as the result of spending from anglers visiting the Project Area. The direct impact in the Wasatch County economy is estimated to be $493,137. Recreation use under the Proposed Action would increase about 96,020 angler days per year. Expenditures by recreationists would increase revenue in the retail and eating and drinking sectors of the Wasatch County economy by about $401,556 per year. Table 3-37 shows the estimated distribution of these impacts from within the Wasatch County economy and outside the County.

3.12.6.3.4 Indirect Revenue Impacts. The Wasatch County economy will be affected by indirect spending as the direct expenditures circulate through the economy. An input/output model developed by the State of Utah, Governor's Office of Planning and Budget was used to estimate the impacts of indirect spending on the economy. For each sector of the economy the model identifies the production input required for a given level of output. Through these interrelationships in the economy, the total direct and indirect impacts on revenue, income and employment can be estimated.

Table 3-38 summarizes the total direct and indirect impacts on the Wasatch County economy during construction. The peak annual direct increase in revenue is expected to be approximately $1,234,315. The peak annual indirect increase in revenue is estimated to be $1,201,251. The total direct and indirect increase in revenue is estimated to be $2,435,566, about two percent of the baseline output for Wasatch County.

Table 3-39 summarizes the total direct and indirect impacts on the Wasatch County economy after construction. The peak annual direct increase in revenue is expected to be approximately $493,137. The peak annual indirect increase in revenue is estimated to be $421,585. The total direct and indirect increase in revenue is estimated to be $914,722, less than one percent of the baseline output for the Wasatch County economy.

3.12.6.3.5 Income and Employment Impacts Within Sectors. Table 3-38 shows the potential income and employment impacts during construction. About 25 temporary jobs would be created during construction of the Proposed Action with a direct increase in income of approximately $983,239 during the peak year of construction. It is estimated that approximately 25% of the jobs and resulting income will be filled by Wasatch County residents. Indirect spending has the potential to support about 16 new jobs in Wasatch County during the peak year of construction increasing income in the county by approximately $517,004. The estimated change in income and employment in Wasatch County during the peak construction season in less than one percent of the baseline conditions.

Table 3-38
Direct and Indirect Socioeconomic Impacts
During Construction

	Proposed Action	Existing Channel	Instream Structures
Direct Change in Revenues	$1,234,315	$862,095	$56,826
Indirect Change in Revenues	$1,201,251	$809,841	$53,061
Total Change in Revenues	$2,435,566	$1,671,936	$109,887
Baseline Revenue[1,2]	$126,535,157	$126,535,157	$126,535,157
% Change in Revenues from baseline	1.92%	1.32%	0.09%
Indirect Change in Earnings	$517,004	$438,971	$29,938
Baseline Earnings[1,2]	$122,018,928	$122,018,928	$122,018,928
% Change in Earnings	0.42%	0.36%	0.02%
Peak Employment (jobs)			
Direct Change in Employment	25	25	6
Indirect Change in Employment	16	15	1
Total Change in Employment	41	40	7
Baseline Employment[1,2]	7,846	7,846	7,846
% Change in Employment	0.24%	0.10%	0.11%

[1]Source: State of Utah Department of Employment Security 1995 indexed to 1997.

[2]Source: Bureau of Economic Analysis 1994 indexed to 1997.

Table 3-39
Direct and Indirect Socioeconomic Impacts
After Construction

	Proposed Action	Existing Channel	Instream Structures
Direct Change in Revenues	$493,137	$208,027	$183,992
Indirect Change in Revenues	$421,585	$191,393	$193,699
Total Change in Revenues	$914,722	$399,420	$377,691
Baseline Revenue[1,2]	$126,676,393	$126,676,393	$126,676,393
% Change in Revenues from baseline	0.72%	0.32%	0.30%
Indirect Change in Earnings	$241,962	$109,449	$110,718
Baseline Earnings[3,4]	$122,054,117	$122,054,117	$122,054,117
% Change in Earnings	0.20%	0.09%	0.09%
Peak Employment (jobs)			
Direct Change in Employment	2.75	1.50	3.50
Indirect Change in Employment	16	6	5
Total Change in Employment	18.75	7.50	8.50
Baseline Employment[3,4]	7,849	7,849	7,849
% Change in Employment	0.12%	0.05%	0.05%

[1]Source: State of Utah Department of Employment Security 1995 indexed to 1997.

[2]Source: Bureau of Economic Analysis 1994 indexed to 1997.

Table 3-39 shows the potential income and employment impacts after construction. About 2.75 permanent jobs would be created after construction of the Proposed Action with a direct increase in income of approximately $97,500. It is estimated that all of these jobs and resulting income will be filled by Wasatch County residents. Indirect spending has the potential to support about 16 new jobs in Wasatch County and is estimated to increase income in the County by approximately $241,962 annually. The estimated change in income and employment in Wasatch County after construction is less than one percent of the baseline conditions.

3.12.6.3.6 Public Services and Related Fiscal Impacts. The Mitigation Commission would ensure that maintenance of the public access corridor established under baseline conditions occurs without adversely impacting the fiscal resources of local agencies.

Impacts to the infrastructure of Wasatch County outside the river corridor are not expected to be significant. Under the Proposed Action and after habitat conditions have responded to project implementation (10 to 15 years after implementation) it is estimated that approximately 75 anglers will be fishing at any one time over and above baseline conditions on weekends and holidays during the peak period of use (June 15 to September 3). This is less than 1% of the forecasted Wasatch County population at that time.

For this analysis, local tax rates on retail sales are estimated to be three percent. The increase in local sales tax revenue would be about $16,773 during construction, and about $30,341 annually after construction. State and federal income tax revenue also would increase as income rises.

There would be a small decrease in property tax revenues collected by Wasatch County under the Proposed Action. Land acquisition in the Core and Expanded Restoration Areas would be approximately 490 and 198 acres respectively for a total of 688 acres. The lands to be acquired are eligible for valuation under the Farmland Assessment Act (Green Belt Taxes). The total valuation of the 688 acres is $189,200 using the average valuation for Class II through IV irrigated acreage in Wasatch County of $275 per acre. The 1997 mill levy is 0.008624 and the total property taxes that would be collected on 688 acres is $1,632.

Wasatch County would be eligible for Federal payments in lieu of taxes (PILT) for lands acquired. Assuming payments are $1.29 per acre per year (BLM 1997), the County would be eligible for PILT payments of $887. Therefore, the net decrease in property tax revenue would be about $745. A separate and minor increase in property tax revenues could occur if the amenities of the Proposed Action increase property values along the Provo River.

Impacts on tax revenues from the Proposed Action and alternatives are summarized in Table 3-40.

3.12.6.3.7 Growth-Inducing Impacts. As described in Section 3.12.5.9, major growth-inducing forces under existing conditions are expected to continue under baseline conditions. The Proposed Action is not expected to induce additional growth in Heber Valley because it would not: 1) change any growth-inducing forces, 2) create a significant number of new job opportunities in Heber Valley or in the areas people commute to from Heber Valley, 3) cause development of new housing, 4) change the affordability of housing, 5) significantly improve the quality of life in Heber Valley, or 6) change land use zoning laws or policies.

3.12.6.3.8 Social Impacts. The following subsections present the social impacts of the Proposed Action.

3.12.6.3.8.1 Farmers and Their Employees. Most farmers and their employees along the Provo River would likely be upset by temporary and permanent disturbances to their operations and adverse to noise, visual and dust impacts during construction. Operations and future plans of some farmers may be affected by permanent removal of land and fencing for the new river channel and side channels. As noted in Section 3.11.6.3.2 of this EIS, some individual farm enterprises may experience adverse impacts on agricultural practices and operations. Some farmers and their employees also may be annoyed by fishermen who trespass and litter on agricultural lands along the Provo River corridor. These impacts will be reduced through management efforts (see Section 1.4.2). After construction, the reduction in income associated with permanent removal of agricultural land could have a negative impact on their disposable incomes and lifestyles. Some of these impacts on the lifestyles, values and attitudes of farmers could be significant during and after construction. The SOPs described in

Table 3-40 Summary of Changes in Annual Tax Revenues Collected After Construction			
	Proposed Action	Existing Channel	Instream Structures
Sales Tax	$30,341	$9,666	$3,899
Green Belt Tax	($1,632)	($18)	0
PILT	$887	$9.80	0
Total	$29,596	$9,658	$3,899

Section 1.9.6.1 of Chapter 1 would help reduce the magnitude of these impacts.

3.12.6.3.8.2 Other Local Business Owners and Their Employees. Construction and retail trade gross revenue would increase during construction as contractors purchase materials and haul waste material from construction sites and as construction workers purchase gasoline and food. Additional recreationists visiting Heber Valley also would raise the income of local business owners and their employees as purchases of food, gasoline, sporting goods and other items increase. This would cause a positive impact on the disposable incomes and lifestyles of affected business owners and their employees.

3.12.6.3.8.3 Local Residents and Property Owners. Some property owners and residents along the Provo River would experience significant and adverse social impacts during and after construction of the Proposed Action, while others would experience positive impacts. Those who would be negatively affected would be upset by such nuisances as noise, dust and traffic impacts. Some would be required to sell portions of their property for the Proposed Action. Unwilling sellers would resent imposition and control by others on their property rights and their sense of independence. Some residents and property owners would be adversely affected by fishermen who trespass, litter or even vandalize their property or cause other nuisances if these intrusions were not controlled. Future development plans of some property owners may be altered by fencing or land-use restrictions.

Beneficial impacts would accrue to local residents who are employed to help construct the Proposed Action. The income of property owners along the Provo River would increase as lands are acquired during construction. After construction, some local residents and property owners would experience direct or indirect increases in income and employment opportunities, especially in retail trade. Property owners along the Provo River may benefit from increased property values. Many residents of this fast growing community would value the open space that would be protected in perpetuity from future development.

3.12.6.3.8.4 Recreationists and Conservationists. Recreationists and conservationists would be pleased by the completion and operation of the Proposed Action because it would achieve several objectives important to these groups. The Proposed Action would restore this section of the Provo River to a naturally functioning riverine ecosystem and provide associated benefits to fish and wildlife resources. The project would help realize the full potential of the Provo River as a sport fishery, opportunities for which are limited throughout the state.

3.12.6.3.8.5 Community Well-Being. There could be an increase in conflicts among social groups as some farmers, residents or property owners experience the negative impacts described above. After construction, there could be conflicts between recreationists and local residents and farmers. However, the intensity of such conflicts would likely be too minor from a regional, community-wide perspective to significantly affect community cohesion and stability, and would be largely minimized by management of the corridor (see Section 1.4.2).

3.12.6.3.9 Impact Summary. Some farmers and their employees, local residents and property owners

would experience significant and adverse social impacts during and after construction of the Proposed Action. Positive employment and income impacts would occur during construction in the construction and retail trade sectors of the economy and for some people directly and indirectly affected, including local business owners, their employees and some local residents. After construction, the Proposed Action is expected to benefit recreationists and cause an increase in revenue and income for the owners and employees of businesses that would serve recreationists. The decrease in agricultural revenue caused by the Proposed Action would be less than the increase in revenue of other sectors, both during and after construction.

3.12.6.4 Existing Channel Modification Alternative

Tables 3-36 through 3-39 summarize the major socioeconomic impacts of the Existing Channel Modification Alternative.

3.12.6.4.1 Population Impacts. This alternative would not increase the population of Heber Valley because it would only cause a minor increase in permanent employment opportunities.

3.12.6.4.2 Agricultural Economics Impacts. This alternative would cause very minor impacts on farm revenue during and after construction (see Tables 3-36 and 3-37) as a small amount of agricultural land is permanently lost to production (7.6 acres).

3.12.6.4.3 Direct Revenue Impacts in Other Sectors. During construction, the peak annual net increase in direct revenues from all sectors of economy is estimated to be $3,755,473 primarily as the result of equipment leases and labor costs. The impact on the Wasatch County economy is estimated to be $862,095. Table 3-36 shows the projected direct changes in revenue in all sectors of the economy and the estimated distribution of these impacts from within the Wasatch County economy and outside the county.

After construction, annual net revenue in all sectors of the economy would increase as recreation use increases. The annual net direct increase in revenues from all sectors of the economy is estimated to be $719,090 primarily as the result of spending from anglers visiting the project area. The impact on the Wasatch County economy is estimated to be $208,027. Expenditures by recreationists would increase revenue in the eating and drinking sectors of the economy by about $125,891 per year. Table 3-37 shows the estimated distribution of these impacts from within the Wasatch County economy and outside the county.

3.12.6.4.4 Indirect Revenue Impacts. Other sectors of the Wasatch County economy will be affected by indirect spending as the direct expenditures circulate through the economy.

During construction, the total direct and indirect increase in revenue in the Wasatch County economy is estimated to be $1,671,936, about one percent of the baseline output for Wasatch County (Table 3-38).

After construction, the total direct and indirect increase in revenue is estimated to be $399,420, less than one percent of the baseline output for the Wasatch County economy Table 3-39.

3.12.6.4.5 Income and Employment Impacts Within Sectors. Tables 3-38 shows the potential income and employment impacts during construction. About 25 temporary jobs would be created during construction of the Existing Channel with a direct increase in income of approximately $1,000,009 during the peak construction season. It is estimated that approximately 25% the jobs and resulting income will be filled by Wasatch County residents. Indirect spending has the potential to support about 15 new jobs in Wasatch County during the peak construction season increasing income in the county by approximately $438,971. The estimated change in income and employment in Wasatch County during the peak construction season is less than one percent of the baseline conditions.

Tables 3-39 shows the potential income and employment impacts after construction. About 1.5 permanent jobs would be created after construction of the Existing Channel Alternative with a direct increase in annual income of approximately $75,000. It is estimated that these jobs and resulting income will be filled by Wasatch County residents. Indirect spending has the potential to support about 6 new jobs in Wasatch County and is estimated to increase income in the county by approximately $109,449 annually. The estimated change in income and employment in Wasatch County after construction is less than one percent of the baseline conditions.

3.12.6.4.6 Public Services and Related Fiscal Impacts. The impacts on public services and fiscal resources under this alternative would be similar to those described in Section 3.12.6.3.8, although less tax revenue would be generated. The increase in local sales tax revenue would be about $17,143 during construction, and about $9,666 a year after construction. State and federal income tax revenue also would increase as income rises.

Under the Existing Channel Alternative, approximately 7.6 acres would be acquired. Green Belt taxes that would not be collected on 7.6 acres is approximately $18. PILT payments would amount to $9.80.

3.12.6.4.7 Growth-Inducing Impacts. This alternative would not induce growth for the same reasons defined in Section 3.12.6.3.7.

3.12.6.4.8 Social Impacts. The social impacts of this alternative would be similar to but of less significance than those described in Section 3.12.6.3.8. Less land would be temporarily and permanently disturbed, and fewer recreationists would visit the area after construction.

3.12.6.4.8 Impact Summary. The same type of impacts described in the summary in Section 3.12.6.3.9 also would occur under this alternative, except farmers, local residents, and property owners would not experience significant and adverse social impacts.

3.12.6.5 Instream Structures Alternative

Tables 3-36 through 3-39 summarize the major socioeconomic impacts of the Instream Structures Alternative.

3.12.6.5.1 Population Impacts. This alternative would not increase the population of Heber Valley because it would only cause a minor increase in permanent employment opportunities.

3.12.6.5.2 Agricultural Economics Impacts. This alternative would not impact agricultural lands during or after construction.

3.12.6.5.3 Direct Revenue Impacts in Other Sectors. During construction, the peak annual net increase in direct revenues from all sectors is estimated to be $228,102 primarily as the result of equipment leases and labor costs. The direct net increase in revenues in the Wasatch County economy is estimated to be $56,826. Table 3-36 shows the projected direct changes in revenue in all sectors of the economy and the estimated distribution of these impacts from within the Wasatch County economy and outside the county.

After construction, revenue in others sectors of the economy would increase as recreation use increases. The annual net direct increase in revenues from all sectors is estimated to be $387,461 primarily as the result of operation and maintenance labor costs required to maintain the instream structures. The direct net increase in revenues in the Wasatch County economy is estimated to be $183,992. Table 3-37 shows the estimated distribution of these impacts from within the Wasatch County economy and outside the county.

3.12.6.5.4 Indirect Revenue Impacts. Other sectors of the Wasatch County economy will be affected by indirect spending as the direct expenditures circulate through the economy.

Table 3-38 summarizes the total direct and indirect impacts on the Wasatch County economy during construction. The total direct and indirect increase in revenue is estimated to be $109,887, less than one percent of the baseline output for the Wasatch County economy.

Table 3-39 summarizes the total direct and indirect impacts on the Wasatch County economy after construction. The total direct and indirect revenue is estimated to increase $377,691 annually, less than one percent of the baseline output for the Wasatch County economy.

3.12.6.5.5 Income and Employment Impacts Within Sectors. Tables 3-38 shows the potential income and employment impacts during construction. About 6 temporary jobs would be created during construction of the Instream Structures Alternative with a direct increase in income of approximately $69,472 during the peak construction season. It is estimated that approximately 25% the jobs and resulting income will be filled by Wasatch County residents. Indirect spending has the potential to support about 1 new job in Wasatch county during the peak construction season increasing income in the county by approximately $29,938. The estimated change in income and employment in Wasatch County during

the peak construction season in less than one percent of the baseline conditions.

Tables 3-39 shows the potential income and employment impacts after construction. About 3.5 permanent jobs would be created after construction of the Instream Structures Alternatives with a direct increase in income of approximately $127,000. It is estimated that all of these jobs and resulting income will be filled by Wasatch County residents. Indirect spending has the potential to support about 5 new jobs in Wasatch County and is estimated to increase income in the county by approximately $110,718 annually. The estimated change in income and employment in Wasatch County after construction is less than one percent of the baseline conditions.

3.12.6.5.6 Public Services and Related Fiscal Impacts. The impacts on public services and fiscal resources under this alternative would be similar to those described in Section 3.12.6.3.6, although less tax revenue would be generated. The increase in local sales tax revenue would be about $1,219 during construction, and about $3,899 a year after construction. State and federal income tax revenue also would increase as income rises.

3.12.6.5.7 Growth-Inducing Impacts. This alternative would not induce growth for the same reasons defined in Section 3.12.6.3.7.

3.12.6.5.8 Social Impacts. The social impacts of this alternative would be similar to and less than those described in Section 3.12.6.4.8. Land would not be permanently disturbed, and fewer recreationists would visit the area after construction.

3.12.6.5.9 Impact Summary. The same type of impacts summarized in Section 3.12.6.3.9 also would occur under this alternative, except it would not cause adverse agricultural economic impacts after construction. The Instream Structures Alternative also would not cause significant and adverse social impacts.

3.12.6.6 No Action Alternative

The No Action Alternative would not cause socioeconomic impacts because baseline socioeconomic conditions would continue. The initial impacts of acquiring a public access corridor along the Provo River would occur under baseline conditions to meet the commitments described in Section 1.4.1 of Chapter 1. These impacts would continue under the No Action Alternative.

3.12.7 Economic Benefits

Another measure of the economic impacts of the project are "economic benefits". Economic Benefits are a measure of the net economic value to society of a project. The term "net economic value" is used to emphasize that it is a measure of the value over and above the costs of participating in the recreation activity as were described in Section 3.12.6. Economic benefits provide a measure of the value of a project to society while expenditures provide a measure of the impact of expenditures on the local economy. While expenditures are important to the local economy they are not considered of measure of the benefits of the project from a national point of view.

Economic benefits can be derived by estimating the willingness to pay for an activity. The FWS has determined that the economic benefits for an angler day of river based fishing similar to that which will be provided on the Provo River in the project area to be $27.07 per angler day. Based on the forecasted angler use described in Section 3.16, the economic benefits of the Proposed Action and alternatives are shown in Table 3-41.

The benefits shown in Table 3-41 show the economic benefits for fishing on the restored Provo River. Other non-angling use values, such as wildlife observation and walking, will also accrue to society that have not been quantified. In addition, non-use values will also be realized by the project. Examples of non-use values of the Proposed Action include the benefits individuals receive by knowing the Provo River has been restored to a more naturally functioning riverine ecosystem even though they don't plan to use it themselves or the benefits individuals would receive by knowing the river corridor has been restored and protected in perpetuity for future generations. Although difficult to quantify, economists have shown that non-use values can be significant and even far outweigh use values (Glen Canyon Environmental Studies, Non-Use Value Committee, 1995).

Table 3-41
Forecasted Economic Benefits Under the Proposed Action Based on Potential Increase in Recreation Angler Days

	Proposed Action	Existing Channel	Instream Structures
Forecasted Angler Use Over Baseline (angler days per year)	96,020	30,103	11,715
Annual Economic Benefits ($27.07/angler day)	$2,599,275	$814,877	$317,126

3.13 Health and Safety

3.13.1 Introduction

The health and safety analysis addresses potential public safety hazards and health risks during and after construction of the Proposed Action and alternatives. The methodology used to conduct the health and safety analysis is described in Appendix B, Section B.2.12. The following impact topics are addressed in the analysis:

- Health and safety hazards during construction
- Hazards related to flooding along the Provo River

3.13.2 Issues Eliminated From Further Analysis

The following issues were raised during scoping and eliminated from further analysis:

- What would be the flooding impact of the PRRP if Jordanelle Dam spills more water than the reconstructed channel capacity?
- What would be the flood-related impacts on public safety from breaching existing dikes?

The Proposed Action and alternatives have been designed to contain 100-year flood events within their dikes, consistent with standard engineering practices. The existing dike system along the Provo River also is designed to contain 100-year flood events. It is very unlikely that future flooding along the river and spills at Jordanelle Dam will exceed the flooding and spills associated with a 100-year event. Jordanelle Dam and Reservoir — and its spillway — were designed to handle the "Probable Maximum Flood" (PMF) event for the watershed. The PMF would occur no more than about once every 1,000 years, based on historic hydrology. If future spills and flooding exceed 100-year event levels, Provo River flows may cause flooding outside the 100-year floodplain and the dikes included in the Proposed Action and alternatives may be breached. This unlikely event would not be an impact of the Proposed Action and alternatives since they have been designed to provide the same level of flood protection that typically occurs under baseline conditions, and they would not affect the operation or capacity of Jordanelle Reservoir. This EIS only assesses the potential impacts of the Proposed Action and alternatives.

3.13.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and addressed in the health and safety impact analysis:

- How would PRRP construction activities affect public health and safety?
- Would the Provo River cause flooding-related public safety hazards?

3.13.4 Description of Impact Area of Influence

The impact area of influence for the health and safety analysis includes areas along the Provo River where the Proposed Action and alternatives would

be constructed and where flooding would occur after construction. It also includes roads used by construction and recreation traffic (Map 3-1 in Section 3.1.1.1 shows the direct impact area of influence.

3.13.5 Affected Environment (Baseline Conditions)

Traffic-related hazards, especially on and near Highways 40, 113 and 189 in Heber Valley, are the most notable public safety hazards under baseline conditions. Schools, residences and many businesses are adjacent to or near these highways.

The existing dike system along the Provo River contains flood events up to and including 100-year events. No flooding occurs from the river in areas outside the dikes. Most of the land within the impact area of influence is not inhabited or regularly used by people.

3.13.6 Impact Analysis

3.13.6.1 Significance Criteria

Any increase in the risk of flooding compared to baseline conditions (i.e., flooding greater than that associated with 100-year flood events) is considered significant.

Health and safety hazards during construction are considered significant if procedures and SOPs would not minimize the risks of accidents to acceptable levels that are typical of projects of this type.

3.13.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential impacts identified during scoping have been eliminated from further analysis.

3.13.6.3 Proposed Action (Riverine Habitat Restoration)

3.13.6.3.1 Construction Hazards. Construction of the Proposed Action would cause a minor increase in the risk of accidents and safety hazards for construction workers and people who travel the same roads as construction traffic. However, the health and safety, transportation, air quality and noise SOPs defined in Section 1.9.6.1 of Chapter 1 would minimize the risks of construction hazards. The SOPs would reduce the risk of accidents to acceptable levels.

The construction contract would require the contractor to protect the work area from flooding and safely pass drainage across the work area. Construction of facilities across stream channels also would be timed to occur during periods of minimal flood risks. To minimize the possibility of increasing flood hazards, the construction contract would address all foreseeable construction activities that could affect the risk of flooding.

3.13.6.3.2 Hazards Related to Flooding. The Proposed Action would increase the frequency of flooding and the size of the floodplain along the Provo River, but there would be very little risk to people since flooding would be contained by dikes and the riparian corridor would be fenced. The operators of Jordanelle Reservoir would know when flooding would occur at least a week in advance. The highest releases and spills would be gradual, taking about a day to rise to peak levels, peaking for about an hour, and then taking a day to recede. The risk to fishermen and other recreationists inside the fenced and diked riparian corridor would be minimal since there would be plenty of time to avoid rising waters.

3.13.6.3.3 Other Hazards After Construction. There would be a slight increase in the risk of traffic accidents along Highways 40, 189, 113 and River Road where the Proposed Action would cause an increase in recreation-related traffic. The Proposed Action would increase the number of recreationists and children visiting the river. Therefore, the risk of such water-related hazards as drowning would increase.

3.13.6.3.4 Impact Summary. There would be a minor risk of increased traffic accidents for motorists driving near construction traffic and when recreation-related traffic increases after construction. However, the SOPs included in the Proposed Action would adequately reduce the risk for workers and the general public during construction. The Proposed Action would increase the frequency of flooding and drowning along the Provo River but there would be very little risk to people because flooding would be contained within dikes. None of these impacts would be significant.

3.13.6.4 Existing Channel Modification Alternative

3.13.6.4.1 Construction Hazards.. Construction hazards and related SOPs under this alternative are the same as described in Section 3.13.6.3.1.

3.13.6.4.2 Hazards Related to Flooding. This alternative would increase the frequency of flooding along the Provo River, but would contain floodwaters within the dikes constructed as part of the alternative. Risks to people would be minimal for the same reasons described in Section 3.13.6.3.2.

3.13.6.4.3 Other Hazards After Construction. The minor increase in traffic accident risks under this alternative would be the same as described in Section 3.13.6.3.3.

3.13.6.4.4 Impact Summary. The impact summary for this alternative is the same as in Section 3.13.6.3.4.

3.13.6.5 Instream Structures Alternative

Potential health and safety impacts for this alternative would be the same as described for the Proposed Action in Section 3.13.6.3, except this alternative would not increase the frequency of flooding along the Provo River because the river channel would not be modified.

3.13.6.6 No Action Alternative

The No Action Alternative would have no impacts on health and safety. Baseline conditions would continue as described in Section 3.13.5 under the No Action Alternative.

3.14 Noise

3.14.1 Introduction

This noise analysis addresses potential impacts from the construction activities and resulting recreation traffic of the Provo River Restoration Project. The methodology used to conduct the noise analysis is defined in Appendix B, Section B.2.13. The following noise topics are addressed in the impact analysis

- Noise from construction activities
- Noise after construction, i.e., from recreation traffic generated by the Proposed Action and alternatives

3.14.2 Issues Eliminated From Further Analysis

None of the noise issues identified during scoping and defined in Section 3.14.3 were eliminated from further analysis.

3.14.3 Issues Addressed in the Impact Analysis

The following issues were raised in scoping and are addressed in the noise impact analysis:

- Would construction of the Proposed Action and alternatives increase noise levels in Heber Valley?
- Would the recreation traffic and increase in recreation use caused by the Proposed Action and alternatives increase noise levels?

3.14.4 Description of Impact Area of Influence

The impact area of influence for the noise analysis includes areas where noise generated by the Proposed Action and alternatives would be heard. Noise would be generated from Heber Valley roads used by construction and recreation traffic and areas along the Provo River where construction activities would occur. Map 3-1 in Section 3.1.1.1 shows the overall impact area of influence.

3.14.5 Affected Environment (Baseline Conditions)

Noise is measured using the A-weighted decibel scale (dBA). Values on this scale represent the loudness of common sounds perceived by humans.

Quantified noise data were not available to help define baseline noise conditions in the impact area of influence. However, some general conclusions can be reached based on field visits and published noise studies (CEQ 1970 and Urban Institute 1976).

Heber Valley is generally a quiet valley except for noise generated by traffic on roads, especially Highways 40, 113 and 189 and River Road. Highway traffic typically generates noise at about 70 dBA with large trucks generating noise up to 90 dBA. These decibel ratings are at a distance of 50 feet, the standard reference distance used in noise studies. Noise from these sources is reduced as the distance from the source increases. A doubling in distance reduces decibel ratings by a factor of four, if there are no other mitigating factors such as trees, walls and other physical barriers.

The only sensitive noise receptors near PRRP construction sites are isolated residences on large lots in rural areas near the Provo River (sensitive noise receptors are locations especially susceptible to noise impacts, such as schools, hospitals, nursing homes and residences). There are some sensitive noise receptors in the central portion of Heber City, including four schools, a hospital and nursing home. None of these are adjacent to Highways 40 and 189.

3.14.6 Impact Analysis

3.14.6.1 Significance Criteria

Noise that would be generated by the Proposed Action and alternatives was considered significant if it would exceed baseline noise levels and acceptable levels defined in EPA's Noise Pollution Level index (EPA 1971). Noise levels are considered significant if activities near sensitive receptors would likely generate noise exceeding levels considered "normally unacceptable" (74 to 88 dBA) in the EPA index. Noise at this level is annoying, and if people are exposed to it for long periods, barriers need to be constructed to make the indoor environment tolerable. Noise levels above 88 dBA are considered "clearly unacceptable" in the EPA index. They are very annoying, can cause hearing damage to people exposed for 8 hours or more, and the cost of constructing barriers to make the indoor and outdoor environments tolerable would be prohibitive.

3.14.6.2 Potential Impacts Eliminated From Further Analysis

All of the noise issues identified during scoping were addressed in the impact analysis.

3.14.6.3 Proposed Action (Riverine Habitat Restoration)

3.14.6.3.1 Noise Related to Construction Activities. Noise would be generated by vehicles and equipment used to construct the Proposed Action. Construction activities would require using such equipment as compactors, bulldozers, loaders, excavators, scrapers and various types of trucks. Typical noise levels of this equipment at 50 feet are defined in Table 1-8 of Chapter 1. The loudest equipment are compactors, bulldozers and loaders (up to 96 dBA at 50 feet), and motor graders and scrapers (up to 95 dBA at 50 feet). Most of this equipment would be confined to construction sites in the Provo River corridor, except for trucks used to haul waste material on Highways 40, 113 and 189 and the smaller roads near construction sites. These types of trucks usually generate noise levels of 70 to 92 dBA at 50 feet.

Some sensitive noise receptors would be near construction sites, i.e., isolated residences near the Provo River corridor. Some residents and pedestrians near construction sites would experience significant and adverse noise impacts during construction Some noise levels would exceed the significance criteria (74 to 88 dBA) for people within about 50 feet of construction sites. Lower noise levels would be experienced by people farther away. Lower noise levels would be experienced by people farther away. The noise impacts would occur during the day for approximately 8 to 10 hours, five days a week throughout the duration of construction.

Baseline noise levels along Highways 40, 113 and 189 include noise from large trucks that typically generate about 70 to 90 dBA. None of the sensitive noise receptors in Heber City are adjacent to Highway 40 or 189, and the noise level from trucks hauling waste material during construction would likely be the same as emitted by large trucks under baseline conditions. Although the frequency of truck noise on the highways would increase until the waste hauling is completed, the noise levels would not be significant for sensitive receptors along highways.

Some of the hauling of waste material would occur on smaller roads in Heber Valley. Significant noise impacts could occur on and near roads that are not used by large trucks under baseline conditions.

Residents, drivers, pedestrians, bicyclists and joggers on and along these roads would experience significant noise impacts as haul trucks drive by.

3.14.6.3.2 Noise After Construction. The Proposed Action would require very little maintenance, and noise after construction would primarily be generated by recreationists.

Recreation traffic would increase noise levels on and along the roads used by recreationists attracted to the improved fishing and other recreation opportunities along the Provo River. The level would likely be the same as traffic under baseline conditions (up to 70 dBA), which falls below the "unacceptable" level of 74 dBA and above. The frequency of noise impacts along the roads would increase as traffic increases.

New recreationists would increase noise levels along the Provo River, especially at and near the seven new recreation access points.

3.14.6.3.3 Impact Summary. The Proposed Action would generate noise levels that exceed the significance criterion for people within about 50 feet of construction sites. Some people would experience significant noise impacts during construction along smaller roads in the impact area of influence that are not traveled by large trucks under baseline conditions. Additional noise impacts would occur along roads from recreation traffic and from recreationists along the Provo River.

3.14.6.4 Existing Channel Modification Alternative

The Existing Channel Modification Alternative would cause the same noise impacts as described for the Proposed Action in Section 3.14.6.3. However, the location of some of the impacts and the people affected by them would be different in some cases since the Proposed Action would include modifying the river channel in areas where no construction would occur under this alternative. This would cause the same types of impacts, but some residents and others would be affected differently because their distance from the noise source would vary.

3.14.6.5 Instream Structures Alternative

The Instream Structures Alternative would cause the same types of noise impacts as described for the Proposed Action in Section 3.14.6.3. However, the potential for significant impacts would be reduced because less equipment and fewer vehicles would be necessary (only backhoes, dozers and excavators would be required). This type of construction equipment would have the potential to cause significant impacts for residents and others close to construction sites. The impacts would occur in the same location as the impacts of the Existing Channel Modification Alternative.

3.14.6.6 No Action Alternative

The No Action Alternative would have no noise impacts. Baseline conditions would continue as described in Section 3.14.5 under the No Action Alternative.

3.15 Visual Resources

3.15.1 Introduction

The visual analysis addresses potential impacts on visual resources from construction of the Proposed Action and alternatives. The focus of the analysis is on potential visual impacts visible from three critical viewpoints: Highway 40 looking south over the Heber Valley, Valley Hills Subdivision and Memorial Hill. The visual analysis methodology is presented in Appendix B, Section B.2.14. The visual resource discipline addresses potential impacts to the following impact topics:

- Views from critical viewpoints focusing on middle-ground and background views

- Changes in existing landscape character attributes

3.15.2 Issues Eliminated From Further Analysis

None of the visual issues raised during scoping and listed in Section 3.15.3 have been eliminated from further analysis.

3.15.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- What visual impacts would occur from the Provo River Restoration Project? How would these visual impacts be mitigated?

- How would the PRRP change the visual character of the Provo River and its riparian corridor?

3.15.4 Description of Impact Area of Influence

The visual impact area of influence consists of about 10 miles of the Provo River corridor between Jordanelle Dam and Deer Creek Reservoir. The corridor width that would be affected during construction and development of the PRRP extends about 1,500 feet on either side of the existing channel. Map 3-1 in Section 3.1.1.1 shows the direct impact area of influence and includes the nine PRRP reaches.

3.15.5 Affected Environment (Baseline Conditions)

The Provo River bisects the picturesque Heber Valley between Jordanelle and Deer Creek reservoirs. The river is easy to identify visually from the three critical viewpoints because of the distinct riparian woodland vegetation growing along its banks. The channelized river alignment and constructed dikes are obvious in the foreground from the Memorial Hill viewpoint. Reach 4, as seen from Memorial Hill and Valley Hills Subdivision, is the most natural looking reach because there are no dikes, and riparian vegetation is most extensive in this reach. The valley adjacent to the river corridor is primarily an open agricultural area. Some residential development has occurred on large lots adjacent to the Provo River corridor.

The visual character of Provo River corridor changes with the seasons as trees leaf out in the spring, turn color, then loose foliage in the fall. The valley and adjacent mountains are covered with snow during some winter months. These seasonal changes are dependent on the color and texture of existing vegetation.

3.15.6 Impact Analysis

3.15.6.1 Significance Criteria

Established visual quality objectives or scenic standards could not be used as significance criteria in this analysis because they do not exist in Wasatch County. Therefore, the visual impacts of the Proposed Action and alternatives are considered adverse and significant if they would be in contrast with baseline landscape attributes, long-term, and seen in the middle-ground or background-distance zones from the critical viewpoints. Visual impacts were considered long-term if affected landscape attributes would not be restored to pre-project conditions within 2 years after completion of project construction.

3.15.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential visual impacts have been eliminated from further analysis.

3.15.6.3 Proposed Action (Riverine Habitat Restoration)

3.15.6.3.1 Visual Impacts Viewed From Highway 40. Visual impacts that would occur in the upper five river reaches (Reaches 5-9) would be most visible from this viewpoint in the middle ground and background distance zones. Construction of the new river channel, new setback dikes and floodplain grading would temporarily remove more than 100 acres of vegetated land along the river corridor, altering the visual texture, color, line and landform of the landscape and resulting in short-term, adverse visual impacts. About 754 mature cottonwood trees would be permanently removed in Reaches 5-9, causing adverse visual impacts from contrasts with existing visual line, landform, texture and color.

Construction of the new river channel under the Proposed Action would permanently change the character of the river from a straight line to a more natural-looking, sinuous river with a wider, irregular riparian corridor. This would result in significant long-term visual improvements that would be very

noticeable from Highway 40 because of the direct view and elevation above the valley. Expansion of the riparian vegetation would add pleasing color, texture and an irregular vegetation boundary to the landscape.

3.15.6.3.2 Visual Impacts Viewed From Valley Hills Subdivision. The nine river reaches are visible in the background distance zone from this viewpoint. Construction of the new channel under the Proposed Action would remove more than 100 acres of existing riparian woodland, shrub and meadow vegetation and permanently remove mature cottonwoods adjacent to the river corridor, resulting in short-term, adverse visual impacts visible from the critical viewpoint in Valley Hills subdivision. Removal of existing vegetation would alter the visual line, form, texture and color in the landscape, adversely impacting the visual quality of Heber Valley during the short-term.

However, the channel realignment associated with the Proposed Action also would create long-term visual improvements from this viewpoint, most notably the expansion of riparian vegetation along the Provo River compared to baseline conditions, which would enhance color, texture and irregular line qualities in the visual landscape. The visual improvement would be less noticeable from the Valley Hills viewpoint than from Highway 40 because the view angle is perpendicular to the river and the viewpoint is lower in elevation than the Highway 40 viewpoint.

3.15.6.3.3 Visual Impacts Viewed From Memorial Hill. All nine river reaches also are visible from this viewpoint, but Reaches 3-6 are viewed in the foreground and middle ground, making disturbance and alignment changes more noticeable in these reaches. More than 100 acres of land along the river corridor would be temporarily disturbed by construction of the new channel, setback dikes and floodplain grading, resulting in short-term, adverse visual impacts caused by disturbed soils and vegetation removal. More than 539 mature cottonwood trees would be permanently removed in Reaches 3-6, altering the visual line, form texture and color in the landscape.

Long-term visual improvements resulting from the channel realignment would be more noticeable from this viewpoint because of the close proximity and elevation above the river. It would take three to 30 years to establish a well defined riparian zone along the river corridor, but the riparian corridor would be expanded and more diverse than it is today. The channel realignment would result in a significant visual improvement in Reaches 3 through 6 from this viewpoint.

3.15.6.3.4 Impact Summary. Short-term visual impacts from removal of existing vegetation would be reduced as riparian vegetation becomes established. Permanent visual improvements would result from the realignment of the existing channel and establishment of a diverse vegetated riparian corridor. Visual impacts and improvements would be related to color, texture, landform and line in the landscape.

3.15.6.4 Existing Channel Modification Alternative

3.15.6.4.1 Visual Impacts Viewed From Highway 40. More than 75 acres of vegetated land adjacent to the Provo River would be temporarily disturbed by modifications to the existing river channel, removal of existing dikes, construction of new setback dikes and new floodplain construction, resulting in short-term, adverse visual impacts. These short-term impacts would consist of changes in color, texture and landform from removal of vegetation, soil disturbance and land grading viewed mostly from the background distance. More than 1,080 mature cottonwood trees would be permanently removed, altering the visual line, texture and color in the landscape. New 2-foot-high setback dikes would be constructed in some locations at the edge of the new floodplain, creating a new landform, line and color in the landscape and causing short-term visual impacts. However, the visual impacts would be less significant from this viewpoint as vegetation becomes established on the dikes and a well defined riparian zone emerges along the river corridor in 5 to 30 years. These long-term visual improvements would enhance the color, texture and irregular vegetation boundary lines.

3.15.6.4.2 Visual Impacts Viewed From Valley Hills Subdivision. Visual impacts under this alternative viewed from Valley Hills Subdivision would be the same as described for Highway 40 in Section 3.18.6.4.1. These impacts, viewed from the background distance zone, would be noticeable as contrasts in color, line, texture and landform. Adverse visual impacts would be reduced as a well defined riparian zone emerges along the river

corridor in 15 to 30 years. Over the long-term, visual quality would be improved by establishing an expanded riparian corridor that would enhance color, texture and irregular vegetation boundary.

3.15.6.4.3 Visual Impacts Viewed From Memorial Hill. Visual impacts under this alternative viewed from Memorial Hill would be the same as described for Highway 40 in Section 3.15.6.4.1. These impacts would be noticeable from the background and middle ground distance zones as contrasts in color, line, texture and landform. Long-term visual improvement from establishing an expanded riparian corridor would include enhancement of texture, color and irregular edge line.

3.15.6.4.4 Impact Summary. Vegetation disturbance from construction of the Existing Channel Modification Alternative would cause short-term changes to color, texture, landform and line when viewed from the three critical viewpoints. Long-term visual improvement would occur over time as riparian vegetation becomes established, resulting in enhancement of color and texture and an irregular vegetation boundary line.

3.15.6.5 Instream Structures Alternative

3.15.6.5.1 Visual Impacts Viewed From Highway 40. No significant visual impacts are expected from this alternative. Removal of minor amounts of bank vegetation for construction of in-stream structures would not be visually detectable from this viewpoint.

3.15.6.5.2 Visual Impacts Viewed From Valley Hills Subdivision. No significant visual impacts are expected from this alternative as described in Section 3.15.6.5.1.

3.15.6.5.3 Visual Impacts Viewed From Memorial Hill. No significant visual impacts are expected from this alternative as described in Section 3.15.6.5.1.

3.15.6.5.4 Impact Summary. No significant adverse visual impacts are expected from this alternative.

3.15.6.6 No Action Alternative

The No Action Alternative would have no visual resource impacts. The baseline visual characteristics described in Section 3.15.5 would continue under the No Action Alternative for some 10 to 20 years. After that time, the number of large mature cottonwood trees is expected to diminish as they die out and recruitment does not occur to replace them.

3.16 Recreation Resources

3.16.1 Introduction

The recreation analysis addresses potential impacts on recreation from the construction, operation and management of the Proposed Action and alternatives. The focus of the analysis is on expected increases in fishing-related recreation (as measured by the number of angler days) related to expected improvements in aquatic habitat and fish production. The recreation analysis methodology is presented in Appendix B, Section B.2.15. The following recreation impact topics are addressed in the impact analysis:

- Changes in the quantity of recreation use (both angler days and recreation that is not related to fishing)
- Physical impacts on baseline and proposed recreation areas
- Impacts on the quality of recreation at baseline and proposed areas

3.16.2 Issues Eliminated From Further Analysis

The following issues were raised during scoping and eliminated from further analysis:

- How would the Utah State Parks Plan for the Provo River be evaluated in the Environmental Impact Statement (EIS), and what would be the cumulative impact of implementing the Utah State Parks Provo River Recreation Project with the PRRP? (This project is also referred to as the Parkway Project and would include new recreation facilities and other improvements to the Provo River corridor between Jordanelle and Deer Creek reservoirs).

This issue was eliminated from further analysis because there are no plans to implement the Parkway Project (UDP&R 1997).

- What opportunities would there be to provide fence crossings that allow pedestrian access without damaging existing fences?

  This issue was eliminated from further analysis because the provision of public access and fencing would occur in the Project Area under baseline and not under the Proposed Action or alternatives.

- What types of recreational activities would be permitted, and what restrictions would be placed on the types of fishing allowed?

  Recreational uses of the corridor would be angling and other compatible uses, e.g. walking, wildlife watching. There would be no motorized vehicles, bicycling, rollerblades, hunting or equestrian use allowed, nor would trails be continuous along both sides of the river. Fishing regulations are promulgated by the Utah Wildlife Board, a state entity, and there is no federal role by the Mitigation Commission or the Department of the Interior in its decisions. It is not known at this time what regulations would be adopted by the Utah Wildlife Board.

- What impacts would an increase in recreational use by bicyclists have on highly sensitive areas along the river?

  As noted above, the Proposed Action and alternatives would not allow bicycling in the river corridor. Therefore, the Proposed Action and alternatives would not cause bicycling-related impacts.

3.16.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- What would be the recreational capacity of the river under the PRRP?

- What impacts would an increase in increased recreational use by fishermen, hikers, joggers and others have on highly sensitive areas along the river?

3.16.4 Description of Impact Area of Influence

The recreation impact area of influence includes approximately 10 miles of Provo River corridor between Jordanelle Dam and Deer Creek Reservoir and adjacent recreation areas such as the Wasatch Mountain State Park, and recreation facilities at Jordanelle and Deer Creek reservoirs. Map 3-1 in Section 3.1.1.1 shows the direct impact area of influence.

3.16.5 Affected Environment (Baseline Conditions)

Anglers fish the Provo River under existing conditions throughout the fishing season with and without permission from land owners and in the limited portions of the Provo River corridor that are now open for public use. Under baseline conditions, seven recreation access points would be constructed along the Provo River and land would be acquired to provide contiguous recreation access to the river corridor. The seven access areas would include parking and toilet facilities.

About 19,980 angler days per year would be supported by the baseline fish population. An angler day equals a person fishing for 2.6 hours. See Section B.2.15 of Appendix B for a discussion of how baseline recreation estimates were prepared and Section 3.5, Aquatic Resources, for information regarding how baseline trout populations were estimated. In addition to fishermen, other types of recreationists also would be attracted to the corridor under baseline conditions. Other types of uses would include bird watching, walking and general nature appreciation.

Actual recreation use under baseline conditions would likely be higher than the 19,980 angler days per year estimate for the following reasons:

- Recreationists other than fishermen would likely be attracted to the corridor once public access is provided

- The new public access corridor that would be established under baseline conditions would be

in close proximity to the large populations of the Wasatch Front, the corridor would include a river with trout populations, and such resources are in short supply within a short drive of the Wasatch Front. Therefore, the new public access corridor would likely attract more anglers than what would be predicted based solely on the river's natural trout production (the baseline angler day estimate is based on the expected natural trout production of the river). The Utah Division of Wildlife Resources could decide to implement a trout stocking program in the river once the public access corridor is established, thus attracting more anglers.

The estimate of 19,980 angler days per year is used for baseline conditions because this number helps define a range of potential impacts and it is too speculative to quantify other types of recreation uses or to predict possible fish stocking practices of the Utah Division of Wildlife Resources.

3.16.6 Impact Analysis

3.16.6.1 Significance Criteria

The following types of impacts on recreation would be considered significant:

- A net reduction or elimination of recreation opportunities
- Physical damage to recreation facilities
- Physical damage to roads or trails that access recreation areas
- A net increase in recreation opportunities
- Potential impacts on the quality of recreation opportunities and uses are considered significant and adverse if the public's expectation for a quality recreation experience would be diminished.

3.16.6.2 Potential Impacts Eliminated From Further Analysis

None of the potential recreation impacts have been eliminated from further analysis.

3.16.6.3 Proposed Action (Riverine Habitat Restoration)

The following subsections describe potential recreation impacts during and after construction of the Proposed Action.

3.16.6.3.1 Changes in Recreation Use. Construction of the Proposed Action would result in a potential long-term increase of about 96,020 additional angler days a year (a 481 percent change) over baseline conditions. This increase would occur over the 10 to 15 years following the completion of the Proposed Action's construction, and as the fish population increases with improvements in habitat and carrying capacity (see Section 3.5, Aquatic Resources, and Appendix B, Section B.2.15, Recreation Analysis Methodology).

Recreation use in the Provo River corridor would continue to increase over the long-term at an assumed annual rate of 2.4 percent (based on the projected rate of population growth along the Wasatch Front) until one of two types of capacity limits are reached: the physical capacity of the parking areas available to recreationists or a crowding capacity limit. The parking areas could potentially support approximately 260,000 angler days per year under an unlikely scenario that assumes 100 percent of the parking capacity is used year-round, on weekends and weekdays, and strict parking regulations are successfully enforced. However, such use levels would likely not be reached because parking lots would probably not be full during the cold weather months and possibly on many weekdays. In addition, a crowding capacity limit (the point at which an area becomes too crowded to attract more recreationists) would likely be reached before the physical parking area capacity limit is reached.

A more likely parking scenario was analyzed using visitor use patterns at other recreation areas in the state. This scenario assumes that parking areas would be fully utilized on weekends and holidays but not fully utilized during cold weather months and during the middle of the week. The recreation use estimates under this scenario are very similar to the estimate presented at the beginning of this section (an approximate increase of 96,020 angler days per year over baseline conditions). Additional information regarding the assumptions used in this

scenario are included in Section B.2.15 of Appendix B.

3.16.6.3.2 Physical Impacts on Recreation Areas

The Proposed Action would cause long-term improvements in the recreational fishery, including a meandering river channel with pools and riffles, and a more scenic and natural river corridor for walking, and wildlife observation. Sensitive riparian areas could be adversely impacted by heavy recreation use if vegetation is trampled or sensitive habitats are disturbed. However, the river corridor will be managed with signs and trail closures as necessary to protect fragile ecological areas. Section 1.4.2 describes management actions and potential responsibilities of the Utah Division of Wildlife Resources in protecting the corridor from resource damage.

3.16.6.3.3 Impacts on Recreation Quality

Recreation quality would be enhanced over the long-term because of the increase in fish standing crop, which would provide greater angling opportunities. Recreation quality also would be enhanced by improved scenic quality and ecological diversity from the development of a naturally functioning river system and associated environment.

Recreation quality would be temporarily reduced during construction in specific reaches by noise, exhaust, equipment operation and lack of recreation access in the immediate construction zone.

3.16.6.3.4 Impact Summary Table 3-42 summarizes the total potential increase in recreation angler days under the Proposed Action by reach. This increase would occur incrementally over the long-term as each reach is constructed and habitat improvements increase the fish population. Sensitive riparian areas could be adversely impacted by heavy recreation use if vegetation is trampled or sensitive wildlife and endangered species habitats are disturbed. However, the proposed management of the corridor would reduce the likelihood of these impacts from occurring, especially to protected ecologically sensitive areas such as Ute ladies'-tress populations, spotted frog breeding areas, or bird nesting areas.

3.16.6.4 Existing Channel Modification Alternative

3.16.6.4.1 Changes in Recreation Use. Construction of this alternative would have the same impacts on recreation use as described for the Proposed Action in Section 3.16.6.3.1, except that the long-term potential increase in annual recreation angler days would be approximately 30,103 additional angler days (or a 151 percent change) over baseline conditions (see Appendix B, Section B.2.15 Recreation Analysis Methodology).

3.16.6.4.2 Physical Impacts on Recreation Areas. This alternative would cause long-term improvements in the recreational fishery, including pools and riffles. Sensitive riparian areas could be adversely impacted by heavy recreation use if vegetation is trampled or sensitive wildlife and endangered species habitats are disturbed. The proposed management of the corridor would reduce the likelihood of these impacts from occurring.

3.16.6.4.3 Impacts on Recreation Quality. Recreation quality would be enhanced over the long-term because of the increase in fish population, which would provide greater angling opportunities.

Recreation quality would be temporarily reduced during construction in specific reaches by noise, exhaust, equipment operation and lack of recreation access in the immediate construction zone.

3.16.6.4.4 Impact Summary Table 3-43 summarizes the total potential increase in recreation angler days under the Existing Channel Modification Alternative and by reach. The increase would occur incrementally over the long-term as each reach is constructed and habitat improvements increase fish production. Sensitive riparian areas would be adversely impacted by heavy recreation use if vegetation is trampled or sensitive wildlife and endangered species habitats are disturbed. The proposed management of the corridor would reduce the likelihood of these impacts from occurring.

3.16.6.5 Instream Structures Alternative

3.16.6.5.1 Changes in Recreation Use. Construction of this alternative would cause the same types of impacts on recreation use as described for the Proposed Action in Section 3.16.6.3.1, except the magnitude of the potential increase in

Table 3-42
Potential Increase in Recreation Angler Days
Under the Proposed Action

Reach	Baseline Angler Days Per Year	Net Increase in Angler Days/Year	Percent Increase Over Baseline
1	1,252	4,939	395%
2	2,025	9,810	485%
3	2,764	12,512	453%
4	2,547	9,925	390%
5	1,634	8,871	543%
6	3,210	16,400	511%
7	1,741	9,366	538%
8	1,693	8,321	491%
9	3,114	15,876	510%
Total	**19,980**	**96,020**	**481%**

Table 3-43
Potential Increase in Recreation Angler Days
Under the Existing Channel Modification Alternative

Reach	Baseline Angler Days Per Year	Net Increase in Angler Days/Year	Percent Increase Over Baseline
1	1,252	1,886	151%
2	2,025	3,050	151%
3	2,764	4,165	151%
4	2,547	3,838	151%
5	1,634	2,462	151%
6	3,210	4,836	151%
7	1,741	2,623	151%
8	1,693	2,551	151%
9	3,114	4,692	151!
Total	**19,980**	**30,102**	**151%**

annual recreation angler days would be substantially smaller (an additional increase of about 11,715 angler days per year (a 59 percent change) would occur over baseline conditions). This is related to proportionate increases in fish biomass (see Section B.2.15 of Appendix B for the related methodology).

3.16.6.5.2 Physical Impacts on Recreation Areas. This alternative would cause short-term and long-term improvements in the recreational fishery from installation of instream fish habitat structures. Sensitive riparian areas could be adversely impacted by heavy recreation use if vegetation is trampled or sensitive wildlife and endangered species habitats are disturbed. Periodic reconstruction of instream structures would disrupt habitats and recreation use to a minor degree every five to ten years.

3.16.6.5.3 Impacts on Recreation Quality. Recreation quality would be enhanced over the long-term because of the increase in fish population, which would provide greater angling opportunities.

Recreation quality would be temporarily reduced during construction in specific reaches by noise, exhaust, equipment operation and lack of recreation access in the immediate construction zone. This would recur every five to ten years as reconstruction/maintenance is required on the instream structures.

3.16.6.5.4 Impact Summary. Table 3-44 summarizes the total potential increase in recreation angler days under the Instream Structures Alternative and by reach. The increase would occur incrementally over the long-term as each reach is constructed and habitat improvements increase fish production.

3.1.6.6.6 No Action Alternative

The No Action Alternative would not cause impacts on recreation resources. The baseline recreation conditions described in Section 3.16.5 would continue under the No Action Alternative and recreation use levels would increase over time at approximately the same rate as population growth along the Wasatch Front.

3.17 Cultural and Paleontological Resources

3.17.1 Introduction

This analysis addresses potential impacts on cultural and paleontological resources during construction of the Proposed Action and other alternatives. The focus of the analysis is on prehistoric, historic, ethnographic and paleontological resources. The information and analysis documented in this section was summarized from the Final Cultural Resources Technical Report (Mitigation Commission 1997h). Assumptions and impact topic analysis methods are summarized in Appendix B, Section B.2.16. The following impact topics are addressed in this impact analysis:

- Cultural impacts during construction

- Paleontological impacts during construction

3.17.2 Issues Eliminated From Further Analysis

The following issues were raised during scoping and eliminated from further analysis:

- What impact would proposed changes in streamflow have on paleontological resources?

  There would be no adverse effects on paleontological resources because there would be no changes in streamflow from the Proposed Action or alternatives.

- What would be the impact on cultural resources from modifications to or removal of levees and dikes?

  All levees and dikes were placed in the river in the 1950s indicating that these are not historic features.

3.17.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

Table 3-44 Potential Increase in Recreation Angler Days Under the Instream Structures Alternative			
Reach	**Baseline Angler Days Per Year**	**Net Increase in Angler Days/Year**	**Percent Increase Over Baseline**
1	1,252	734	59%
2	2,025	1,187	59%
3	2,764	1,621	59%
4	2,547	1,494	59%
5	1,634	958	59%
6	3,210	1,882	59%
7	1,741	1,021	59%
8	1,693	993	59%
9	3,114	1,826	59%
Total	**19,980**	**11,715**	**59%**

- What would be the impact of new channel or side channel construction?
- What would be the impact of O&M road construction?
- What would be the impact of disturbance or expansion of the 100-year floodplain?
- What would be the impact of enhancement or stabilization of the river channel and banks?
- What would be the impact of modifications to possibly historic bridges

3.17.4 Description of Impact Area of Influence

The cultural and paleontological resources impact area of influence consists of all areas of construction of the Proposed Action and alternatives along the Provo River between Jordanelle Dam and Deer Creek Reservoir. Map 3-1 in Section 3.1.1.1 shows the direct impact area of influence.

3.17.5 Affected Environment (Baseline Conditions)

Baseline conditions are the same as existing conditions. No prehistoric sites or paleontological localities have been recorded within the impact area of influence. Existing literature studies indicate that seven historic archaeological sites and numerous historic standing structures were previously recorded in the current impact area of influence. The seven historic sites consists of the Heber Light and Power Company plant, which was largely destroyed in 1988, the Timpanogos diversion dam and associated canals, a milk barn foundation, the Mayflower Mine complex, the Tate dairy farm and homestead, the Mahoney homestead and the Utah Valley Railroad. There are many more historic standing structures in Heber Valley outside the area of influence. Only a small portion of the impact area of influence has been surveyed, so these sites may not accurately represent additional sites that may be located in the impact area of influence.

3.17.6 Impact Analysis

3.17.6.1 Significance Criteria

3.17.6.1.1 Cultural Resources Significance Criteria. Impacts are considered significant if they result in adverse effects on known sites that are deemed eligible for or are already listed on the National Register of Historic Places (NRHP). The rationale for this significance criterion is based on the federal legislation discussed below.

Eligibility for the NRHP is determined by criteria included in federal implementing regulation 36 CFR 60.4, which states that consideration is given to "districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and; (A) that are associated with events that have made a significant contribution to the broad patterns of our history; or (B) that are associated with the lives of persons significant in our past; or (C) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or (D) that have yielded, or may be likely to yield, information important in prehistory or history."

Federal implementing regulation 36 CFR 800 states that cultural resource assessments of federal "undertakings" of eligible properties should result in one of three determinations:

- No effect
- No adverse effect, i.e., one or more historic properties will be affected but the historic qualities that make them significant will not be harmed
- Adverse effect, i.e., the undertaking will cause harm to one or more historic properties.

3.17.6.1.2 Paleontological Significance Criteria. Impacts will be considered significant if they result in adverse effects on Type 1 or 2 paleontologically sensitive geological formations or in adverse effects on Class 1, 2, or 3 paleontologically sensitive fossil localities. The definitions and rationale for these criteria is discussed below.

Paleontological research and the determination of significant effects are guided, in part, by a geologic formation classification system and a sensitivity classification of fossil localities, both suggested by the Bureau of Land Management (BLM) and modified from National Academy of Sciences (NAS) Committee on Guidelines for Paleontological Collecting (NAS 1987). It also is guided by a priority fossil list entitled Paleontologically Sensitive Formations in Utah by Jim Madsen (undated), former State Paleontologist for the state of Utah.

Following is a description of the classification system for defining the paleontological sensitivity of geological formations:

- Type 1: Formations known to contain fossils of significant scientific interest, or where significant fossils (especially vertebrates) are likely to be discovered with detailed field work
- Type 2: Formations where fossils are present, but by their nature are not anticipated to be of high scientific value (but are still considered to be important)
- Type 3: Formations containing few fossils or those found are of little scientific value

Following is a description of the classification system for defining the paleontological sensitivity of fossil localities:

- Class 1: Critical — reference locality for holotype or critical paleontological material, or any type section of geological strata needed for future study. All vertebrate fossil sites fall within this category.
- Class 2: Significant — any locality that produces rare, well-preserved, or critical fossils usable for taxonomic, evolutionary, stratigraphic, paleoenvironmental, or paleoecological studies
- Class 3: Important — any locality that produces common, abundant fossils useful for stratigraphic or population variability studies

- Class 4: Insignificant — any locality with poorly preserved, common, or stratigraphically unimportant fossil material

- Class 5: Unimportant — any locality intensively surveyed and determined to be of minimal scientific interest

3.17.6.2 Potential Impacts Eliminated from Further Analysis

None of the potential cultural and paleontological impacts of the PRRP have been eliminated from further analysis.

3.17.6.3 Proposed Action (Riverine Habitat Restoration)

No known cultural resources would be adversely impacted by the Proposed Action, but it is likely that historic farmsteads, sheds, fences and other historic features that have not yet been recorded could be adversely affected. Since complete cultural and paleontological resources surveys of the impact area of influence have not been completed, the location and extent of potential impacts on these resources is not known.

The Mitigation Commission has entered into a Programmatic Agreement, July 1997, with the Advisory Council on Historic Preservation, the State Historic Preservation Officer and the Department of Interior pursuant to 36 CFR 800, regulations for implementing Section 106 of the National Historic Preservation Act. This agreement will facilitate the process for the identification, evaluation and treatment of historic properties that may be impacted under the Proposed Action or alternatives. In summary, the Mitigation Commission will conduct a survey of historic property in the Project Area. In consultation with the State Historic Preservation Officer, evaluate the significance of properties identified in the survey and determine their eligibility for the National Register of Historic Places. The Mitigation Commission will develop and implement Treatment Plans that will minimize and mitigate effects on historic properties in accordance with the Advisory Council's *Treatment of Archaeological Properties* and the *Secretary of Interior's Standard and Guidelines for Archaeology and Historic Preservation.*

3.17.6.4 Existing Channel Modification Alternative

This alternative would have the same potential impacts as described in Section 3.17.6.3.

3.17.6.5 Instream Structures Alternative

This alternative may have minor impact on cultural resources because some ground disturbance would take place outside the channel when placing instream structures in the existing Provo River channel. However, the same Programmatic Agreement would apply to this alternative.

3.17.6.6 No Action Alternative

The No Action Alternative would have no impacts on cultural resources. Baseline conditions would continue as described in Section 3.17.5 under the No Action Alternative.

3.18 Transportation

3.18.1 Introduction

The transportation analysis addresses potential impacts on transportation systems during and after construction of the Proposed Action and alternatives. The focus of the analysis is on potential traffic impacts during construction. The methodology used to conduct the transportation analysis is described in Appendix B, Section B.2.17. The following transportation impact topics are addressed in the impact analysis:

- Transportation impacts during construction (changes in traffic and physical impacts on roads)

- Transportation impacts after construction (changes in traffic)

3.18.2 Issues Eliminated From Further Analysis

None of the transportation issues raised during scoping have been eliminated from further analysis.

3.18.3 Issues Addressed in the Impact Analysis

The following issues were raised during scoping and are addressed in the impact analysis:

- How would existing bridges be affected by the PRRP?

- What effects would the PRRP have on roads and transportation systems during construction?

- What effects would increased recreational use of the Provo River have on transportation systems?

3.18.4 Description of Impact Area of Influence

The transportation impact area of influence consists of roads that would be used during construction of the Proposed Action and alternatives, bridges affected by construction, and roads that would be used by recreationists to access the Provo River following construction. The specific roads included in the impact area of influence are defined in Section 3.18.5.

3.18.5 Affected Environment (Baseline Conditions)

The Heber Valley road system consists of three major roads: two federal highways (Highways 40 and 189) and a state highway (Highway 113). These three roads and River Road would be the primary travel routes for construction workers, other construction vehicles and recreationists. Other local roads would be less affected.

Baseline AADT traffic levels, which would exist during construction around the year 2000, are expected to be 10,550 on Highway 40; 3,748 on Highway 113; 1,262 on River Road; and 6,167 on Highway 189. Peak traffic occurs during commute hours when many Heber Valley residents commute to Provo, Orem, Park City or Salt Lake City. While traffic data is not available for other roads that would be affected by the PRRP, construction traffic on these roads would be more dispersed and lighter than on the roads identified above.

Two bridges would be affected by the PRRP: the private Casper Bridge in Reach 2 and another private bridge in the upper portion of Reach 9 (see Map 3-1 in Section 3.1.1.1). These bridges are only used by adjacent property owners to cross the Provo River.

3.18.6 Impact Analysis

3.18.6.1 Significance Criteria

The transportation significance criteria are based on federal and state regulations and standards, professional judgment and contacts with state and county officials. The following types of impacts on transportation systems would be considered significant:

- Travel delays of more than 10 minutes at any one time

- Physical damage to roads that is not repaired to a level equal to or better than the condition of the affected roads before construction of the Proposed Action and alternatives

3.18.6.2 Potential Impacts Eliminated From Further Analysis

Physical impacts on roads from heavy construction vehicles were eliminated from further analysis because the SOPs defined in Section 1.9.6 of Chapter 1 include a commitment to repair all damage to local roads from PRRP construction activities.

3.18.6.3 Proposed Action (Riverine Habitat Restoration)

3.18.6.3.1 Transportation Impacts During Construction. Construction of the Proposed Action would cause the following types of transportation impacts:

- An increase in the amount of traffic on local roads as workers commute to and from construction sites, and various types of other vehicles are used during construction

- An increase in the amount of traffic on local roads as soil, rocks and other spoil material (also referred to as waste material) is hauled to

the disposal site near Highway 189 and Charleston

- Physical impacts on roads from the traffic described above and on two bridges from construction procedures

The Proposed Action would be constructed in reaches, starting near Jordanelle Reservoir. This would congregate traffic on roads near the segments that are being constructed. When construction occurs north of Heber City and near Highway 40 (Reaches 9, 8 and 7), construction traffic would congregate on Highway 40. During this phase, trucks used to remove spoil from the construction area would travel south on Highway 40 and southwest on Highway 189 to the spoil disposal site near Charleston. As construction moves to Reaches 6 and 5, traffic would congregate on River Road. Construction traffic would be concentrated on Highway 113 when construction moves further downstream in Reaches 4, 3, 2 and 1. The spoil disposal trucks would travel south on Highway 113 or Highway 40 to Highway 189.

Traffic would increase on Highways 40, 113 and 189 and River Road during the entire construction period as workers commute to work sites from the Salt Lake City, Provo and Orem areas. Traffic would increase on smaller, local roads that would be used by construction workers living in Heber Valley. Heavy construction vehicles such as bulldozers, excavators and backhoes would be left overnight at construction sites and moved short distances from one construction segment to another. The average duration of construction per Reach would be about 1 year.

Table 3-45 summarizes the peak traffic impacts of the Proposed Action and alternatives. Peak traffic during construction would occur where construction workers and spoil disposal trucks would need to travel on the same road. This is expected to occur on Highway 40 north of the junction with Highway 113, on River Road, and on Highway 113. The incremental increase in peak traffic on River Road and Highways 40, 189 and 113 is provided along with the percentage increase in peak traffic.

A daily peak of about 39 construction-related round-trips would occur under the Proposed Action on Highways 40 and 113 and River Road, including 29 worker round-trips (4 of them management staff round-trips), and 10 round-trips by spoil disposal trucks. This would be a peak daily increase of 78 total trips on each road. A total of 27,300 construction-related round-trips would occur in the impact area of influence over the entire construction period of 5 years and 7 months.

In addition to the peak traffic impacts, less concentrated and smaller increases in traffic would occur on the roads noted above and others in Heber Valley during the entire construction period. Local roads would experience minor traffic increases from an estimated seven workers that would likely commute from Heber Valley to construction sites.

Traffic increases during construction of the Proposed Action would not have adverse and significant impacts because they would not cause delays except for possible minor delays for motorists who might have to wait to pass large trucks. The Proposed Action would not cause delays because the capacities of the affected roads are more than sufficient to handle the estimated increases in traffic associated with construction. The capacities of the affected roads are more than sufficient to handle the estimated increases in traffic associated with construction and operation of the Proposed Action. The paved roads in Heber Valley typically have capacities ranging from 300 vehicles per hour on smaller roads to 1,000 vehicles per hour on Highways 40 and 189 (Sowby and Berg 1993; UDOT 1995). The capacity of Highway 40 would double once the UDOT upgrade (see Chapter 1, Section 1.11) is completed. Baseline traffic levels are low enough to accommodate traffic increases associated with the Proposed Action. For example, baseline AADT on Highway 40 (10,550 daily trips) plus the traffic associated with the Proposed Action (310 daily trips) would be well within the capacity of Highway 40 (i.e., a total of 10,860 daily trips during construction of the Proposed Action would average 453 vehicles per hour).

Construction of the Proposed Action would require reconstruction of two private bridges, the Casper Bridge in Reach 2 and another in Reach 9. The bridges, used only by adjacent property owners, would be unusable for about 2 months, causing some temporary delays and inconvenience for people who would need to use alternate transportation routes.

3.18.6.3.2 Transportation Impacts After Construction. The Proposed Action would be self-sustaining and would require very little maintenance. Infrequent inspections and

Table 3-45
Peak Traffic Impacts During Construction of the Proposed Action and Alternatives
(Daily Vehicle Trips)

	Highway 189 (From Charleston to Hwy. 40 Junction)	**Highway 40 (From Jordanelle Dam to Hwy. 189 Junction)**	**River Road (From Hwy. 40 Junction to Hwy. 113 Junction)**	**Highway 113 (From Hwy. 40 Junction to Hwy. 189 Junction)**
PROPOSED ACTION (RIVERINE HABITAT RESTORATION)				
Baseline Traffic[1]	6,167	10,550	1,262	3,748
Total Peak Traffic During Construction[2]	6,206	10,628	1,340	3,826
Increase in Traffic	39	78	78	78
Percent Change	**1.0%**	**1.0%**	**6.2%**	**2.1%**
EXISTING CHANNEL MODIFICATION ALTERNATIVE				
Baseline Traffic	6,167	10,550	1,262	3,748
Total Peak Traffic During Construction	6,188	10,589	1,340	3,787
Increase in Traffic	42	78	78	78
Percent Change	**1.0%**	**1.0%**	**6.2%**	**2.1%**
INSTREAM STRUCTURES ALTERNATIVE				
Baseline Traffic	6,167	10,550	1,262	3,748
Total Peak Traffic During Construction	6,172	10,563	1,288	3,761
Increase in Traffic	12	26	26	26
Percent Change	**0.2%**	**0.2%**	**2.1%**	**1.0%**

Notes:

[1]Baseline traffic data are estimates of Annual Average Daily Trips in the year 2000; Source: UDOT 1992 data adjusted with a 3 percent annual growth rate
[2]Total peak traffic during construction is baseline traffic plus peak daily vehicle trips during construction of the Proposed Action and alternatives

maintenance by a limited number of workers would cause a minor increase in traffic on local roads.

Additional recreationists would be attracted to the Provo River after the Proposed Action is constructed (see Recreation analysis in Section 3.16). This would increase traffic primarily on Highways 40, 113 and 189, and River Road as recreationists drive to the Provo River. The increase in traffic would not be significant because it would not cause delays to motorists on the affected roads.

3.18.6.3.3 Impact Summary. The Proposed Action would increase traffic during construction and as recreationists drive to the Provo River corridor after construction. The largest increase in traffic during construction would occur on River Road (a peak increase of 6.2 percent). Two private bridges also would be reconstructed.

3.18.6.4 Existing Channel Modification Alternative

3.18.6.4.1 Transportation Impacts During Construction. Transportation impacts for this alternative would be the same as for the Proposed Action in Section 3.18.6.3.1, except this alternative would not impact bridges.

Table 3-45 includes a summary of the peak traffic impacts of this alternative. A peak of about 39 construction-related, daily round-trips would occur on Highway 40, River Road and Highway 113. About 21 construction-related, daily round-trips would occur on Highway 189. A total of 20,700 construction-related round-trips would occur in the impact area of influence over the entire construction period of 4 years and 1 month. Since these traffic increases would be well within the capacity of the roadways, they not cause significant delays to motorists.

3.18.6.4.2 Transportation Impacts After Construction. This alternative would require very little maintenance. Infrequent inspections and maintenance by a limited number of workers would cause an insignificant increase in traffic on local roads.

The increase in recreation opportunity caused by this alternative would cause an increase in traffic on Highways 40, 113 and 189, and River Road as recreationists travel to the Provo River. The increase in traffic would not be significant because it would not cause delays to motorists on the affected roads.

3.18.6.4.3 Impact Summary. This alternative would cause increases in traffic during construction and as recreationists drive to the Provo River corridor. The largest increase in traffic during construction would occur on River Road (a peak increase of 6.2 percent).

3.18.6.5 Instream Structures Alternative

3.18.6.5.1 Transportation Impacts During Construction. Construction of this alternative would increase traffic as workers drive to sites and haul rocks. Spoil disposal trips would not be necessary, and this alternative would not impact traffic on bridges. The same roads used by workers to construct the Proposed Action would be used to construct this alternative.

About six construction-related, daily round-trips would occur on Highway 189. The maximum percentage increase in AADT during construction of this alternative would be less than 1 percent on Highways 40 and 189, about 1 percent on Highway 113, and about 2 percent on River Road. A total of 926 construction-related round-trips would occur in the impact area of influence over the entire construction period of 5 months. Since these traffic increases would be well within the capacity of the roadways, they would not cause significant delays to motorists.

3.18.6.5.2 Transportation Impacts After Construction. This alternative would require very little maintenance. Infrequent inspections and maintenance by a limited number of workers would not cause a significant increase in traffic on local roads.

The increase in recreation opportunities caused by this alternative would primarily increase traffic on Highways 40, 113 and 189 and River Road as recreationists travel to the Provo River. The increase in traffic would not be significant because it would not cause delays to motorists on the affected roads.

3.18.6.5.3 Impact Summary. This alternative would cause increases in traffic during construction

and as recreationists drive to the Provo River corridor. The largest increase during construction would occur on River Road (a peak increase of 2.1 percent).

3.18.6.6 No Action Alternative

The No Action Alternative would have no impacts on transportation. Baseline conditions described in Section 3.18.3.4 would continue under the No Action Alternative.

3.19 Mitigation

3.19.1 Introduction

This section describes proposed mitigation for significant impacts caused by the Proposed Action and PRRP alternatives. Mitigation measures are proposed where feasible and practical for resources that would incur significant impacts.

3.19.2 Wetlands

The overall intent of the Proposed Action is to restore a naturally functioning riverine system that would provide for restoration, enhancement and creation of high-value, functioning wetland habitats within the river corridor. However, construction of the Proposed Action and the Existing Channel Modification Alternative would result in the temporary and permanent loss of some existing wetlands.

3.19.2.1 Wetland Mitigation Priorities

The Mitigation Commission would mitigate for wetland impacts of the Proposed Action by developing specific wetland mitigation plans for each segment of the river during final design and submit them to the COE for review in accordance with Section 404 permit requirements. The Section 404(b)(1) analysis is contained in Appendix I. Following is the Mitigation Commission's prioritized wetland mitigation approach:

1) Steps will be taken during final design to reduce the wetland impacts on all wetland types to the extent possible. Analyses presented in this EIS represent maximum anticipated adverse impacts.

2) The Mitigation Commission will seek opportunities to restore and enhance existing wetlands or to create wetlands within the reconstructed floodplain (under the Proposed Action and Existing Channel Modification Alternative) so they would function and be maintained naturally through connection with the riverine hydrology as a project feature.

3) Enhancement or restoration of existing wetlands through protection and management for wetland value would be pursued on properties acquired adjacent to the 2-year floodplain.

4) If needed, and particularly as compensation for impacts to USBR-constructed wetlands in Reaches 8 or 9, the Mitigation Commission would propose similar wetland restoration projects outside the immediate project vicinity as were accepted by the COE as mitigation for impacts of the Municipal and Industrial System under USBR's Section 404 permit for Jordanelle Dam. These mitigation measures would provide high-value wetlands protection and management capabilities.

5) The Mitigation Commission would construct features (i.e., diversions, dikes) in the project vicinity to create new wetlands in suitable locations, only after opportunities to provide wetlands within the floodplain area have been maximized.

3.19.2.2 Summary Description of Impacted Wetlands

Under the Proposed Action, 62.3 acres of emergent marsh and wet/moist meadow wetlands would be removed by construction of the new river channel, floodplain grading and placement of setback dikes. An estimated 18.7 acres of wet/moist meadow and emergent marsh would be created or enhanced by development and management of ponds and side channels, leaving a net adverse impact on wet/moist meadow wetland of 43.6 acres. The 43.6 acres includes 25.9 acres of mitigation wetlands constructed by USBR as partial mitigation for wetland impacts of Jordanelle Dam, a component of the Municipal and Industrial System of the Bonneville Unit. This wetlands mitigation was previously required by the COE under a Section 404 Permit that required USBR to accomplish successful

wetland mitigation by 1998. Mitigation measures proposed by the Mitigation Commission for this anticipated impact are described in greater detail in the following sections.

The impacted wet/moist meadow wetlands have functional values ranging from very low to relatively high. Low-value wetlands that would be removed by construction of the Proposed Action and the Existing Channel Modification Alternative consist of irrigated agricultural fields used mainly for hay production and pasture. These wetlands have the following characteristics: 1) they are relatively flat and interspersed throughout upland areas; 2) wetland species are dominated by Nebraska sedge, Kentucky bluegrass and reed canary grass; 3) the water source consists of flood irrigation or irrigation drainage and return flow that collects on the surface — in some cases because it is blocked by dikes from reaching the river; and 4) many of the low-functioning agricultural wetlands are grazed by livestock. Because many of these low-value wet/moist meadow wetlands would not meet federal criteria for jurisdictional wetlands, they are not likely to be regulated or protected under Section 404. However, wetlands were not delineated for jurisdictional versus non-jurisdictional status. The Mitigation Commission will conduct such delineations if required by the COE as a condition of a Section 404 permit. However, the Mitigation Commission has proposed to mitigate for all wetlands impacts, whether or not they involve jurisdictional wetlands. The low-value wet/moist meadow wetlands are subject to land use changes, deliberate drainage and changes in water management practices that could affect their existence in the future.

Higher-value wetlands are composed of a mosaic of wetland community types that include diverse topography, a wide range of water regimes, organic soils, and a diversity of plant communities. The majority of the high-value wetlands are on publicly owned lands in Reaches 7, 8 and 9.

3.19.2.3 Proposed Wetland Mitigation

One potential mitigation measure for the Proposed Action or Existing Channel Modification Alternative is the permanent protection and enhancement of a property that was recently purchased for angler access and PRRP purposes. The property is situated in Reaches 7 and 8, and includes a total of 64.7 acres consisting of 40.6 acres on the west side of the Provo River, 17.2 acres between the east side of the river and U.S. Highway 40, and 6 acres in the existing Provo River channel. (See Map A-1 in pocket at back of EIS). The property receives water from several readily identifiable sources including: 1) groundwater from Condie Pond; 2) hillside seeps and springs on the western boundary; 3) surface stream flows, and 4) an apparent perched water table in some areas. Wetland community types found on the property include sedge meadows, riparian woodland and emergent marsh. Flowing channels and interspersed upland islands add additional biodiversity. The wetland communities on the property provide important wildlife habitat for a number of wetland-dependent mammals, waterfowl and song birds. There also is potential habitat for Ute ladies'-tresses which is a Threatened species, and strong populations of spotted frog, a Candidate species as identified by the FWS (see SectionÊ3.19.3). Certain wetland functions, such as wildlife habitat, are reduced from their potential because the property was grazed and not managed for wetland values before it was acquired. A small portion of the property also is overgrown with several thistle species.

The property is bounded on the south by another parcel recently acquired by The Nature Conservancy that also contains high-value wetlands. In combination, these lands provide some of the best wetland habitat within the impact area of influence. The location of the property in relationship to the wetlands owned by The Nature Conservancy makes it more valuable as a mitigation area that can be enhanced and protected. The completed acquisition of the proposed mitigation property and elimination of livestock grazing enhances and protects the higher wetland functions and values up-front, before any impacts occur from construction of the PRRP.

Five additional properties along the Provo River have been reviewed by the Mitigation Commission for opportunities to protect and enhance wetland values as mitigation areas. Not all of the five properties would be required. Following are brief descriptions of these properties.

- Property 1. This 24-acre parcel is on the east side of the Provo River at the upper end of Reach 4, in the NW 1/4 of the SW 1/4 of Section 25, Township 3 South, Range 4 East. The parcel is a wet meadow type wetland with

a ditch running along the western boundary and through a cattail slough on the northwest side. The parcel receives water from over-irrigation of adjacent lands. Vegetation includes sparse willows adjacent to the river, sedges, wiregrass and pasture grass. This property is potential habitat for peregrine falcon, Ute ladies'-tresses and spotted frog. Enhancement and protection against future development of the property also provides a buffer along the river that would help protect water quality.

- Property 2. This 21-acre parcel is on the west side of the Provo River in Reach 3, just south of the Heber City wastewater treatment plant lagoons in the NE 1/4 of the SW 1/4 of Section 1, Township 4 South, Range 4 East. The present land use is irrigated pasture. The general lay of the land is flat with undulating micro-topography that collects surface water. Wet meadow vegetation is composed of sedges, wiregrass and pasture grasses with scattered clumps of cottonwood, hawthorn and willows. Existing water supplies include irrigation drainage, the Everett Slough and groundwater discharge from up-gradient areas. Downed trees and other woody debris provide cover and micro-habitats for wildlife species. The property is potential habitat for Ute Ladies-tresses and spotted frog. Enhancement and protection of this property also provides a buffer between the wastewater lagoons and the river that could help protect water quality.

- Property 3. This 34-acre parcel is on the west side of the Provo River in the NW 1/4 of the SW 1/4 of Section 1, Township 4 South, Range 4 East. It is contiguous to Property 2 described above. The present land use is irrigated pasture. Topography, water supply and vegetation are very similar to Property 2.

- Property 4. This 29-acre parcel is in the NE 1/4 of the NE 1/4 of Section 11, Township 4 South, Range 4 East. It is comprised of the following three properties: 1) 8 acres on the west side of the Provo River immediately south of the railroad bridge; 2) 12 acres on the east side of the river immediately south of the railroad bridge; and 3) 9 acres on the west side of the Provo River just north of the railroad bridge. The present land use is irrigated pasture. The water supply to the 8 and 9 acre properties is fed by Island Ditch irrigation return flows, Everett Slough return flows and groundwater discharge. Water supply to the 12-acre parcel is from the lower Charleston Canal and groundwater discharge. Existing ditch channels meander through the overall parcel. There is a small open-water area on the northwest parcel where the Everett Slough discharges into the Provo River. The soils are Kovich series. Vegetation includes sedge, wiregrass and pasture grasses. This parcel offers opportunities for protection and enhancement of high-value wetland functions (i.e., water quality, wildlife and threatened and endangered species habitat).

- Property 5. This is a 25- to 30-acre parcel situated in the SE 1/4 of the NW 1/4 of Section 1, Township 4 South, Range 4 East, between the lower Charleston Canal and Spring Creek, about 500 to 600 feet from the east bank of the Provo River. The gently sloping site has undulating micro-topography with meandering irrigation drainage channels, dense soils and a perched water table. The present land use is irrigated pasture. The parcel offers opportunities for enhancement of wetland soils and vegetation through elimination of grazing and protection of habitat for wildlife and threatened and endangered species. Protection against future development would provide a buffer for this segment of Spring Creek.

Following are overall ecological benefits of enhancing and protecting existing wetlands on properties adjacent to the Provo River and contiguous with the PRRP corridor as mitigation for impacts under the Proposed Action:

- On-site, in-kind mitigation for wet/moist meadow wetland losses

- Improvement of plant and animal biodiversity

- Establishment of an expanded, protected wetland and riparian buffer along certain reaches of the Provo River. This would help protect water quality and upgrade wildlife habitat carrying capacity, including habitat for Ute ladies'-tresses and spotted frog

- Control of noxious weeds

- Permanent protection of some non-jurisdictional wetlands that could otherwise be lost due to future land-use changes, modifications to water management practices or intentional drainage as the Heber Valley continues to develop in the future. As unprotected wetlands are developed, protected wetlands will become more socially and ecologically significant.

- Elimination of impacts from livestock grazing

- The building and maintenance of productive organic wetland soils through production and decay of wetland plant materials

3.19.2.4 Wetland Mitigation Monitoring

Enhancement and protection of all the mitigation properties would be monitored by the Mitigation Commission or their authorized representative to determine and document that wetland enhancement and protection of wetland values are meeting mitigation goals and objectives that would be identified by the COE in a Section 404 Permit. Monitoring would be conducted to evaluate soil moisture, side-channel flows, plant succession, regeneration and production, weed invasion, species diversity and the presence of threatened and endangered species. A monitoring report would be prepared to document monitoring results and define any future actions needed to make sure the mitigation properties reach their full wetland-value potential.

3.19.3 Threatened and Endangered Species

3.19.3.1 Ute Ladies'-tresses

Existing known colonies of Ute ladies'-tresses would be avoided during construction. Riparian woodlands and riparian scrub habitats developed in the constructed floodplain under the Proposed Action and Existing Channel Modification Alternative would fully replace potential but unoccupied habitat for Ute ladies'-tresses that would be removed during construction. Should monitoring indicate that habitat needs are not being met by development of riparian woodlands, additional measures would be identified through consultation with the FWS and implemented. These could include artificial maintenance of existing Ute ladies'-tresses colonies, additional surveys, wetland habitat manipulations, and other appropriate conservation measures.

Existing colonies of Ute ladies'-tresses would be conserved by allowing water to flow continuously into the occupied side-channels from the new river location. A proposed side channel under the Proposed Action in a portion of the current Provo River channel near the known colonies would receive continuous flow from the new river channel and some overflow during flooding events. Continuous flow into this side channel would minimize the potential for loss of the colonies, and a 170-foot buffer zone around the colonies would be sufficient to avoid impacts of construction. This buffer zone would be surrounded by orange fencing and posted with signs stating "Conservation Area — Do Not Disturb." The presence of threatened Ute ladies'-tresses would not be stated on the signs to avoid unwanted attention.

The constructed floodplain and resulting riparian woodland proposed in Reaches 7 and 8 would provide additional suitable habitat for Ute ladies'-tresses. The alignment of the Proposed Action has been modified from the Draft EIS in response to comments about potential impacts on spotted frogs and wetlands. The alignment of the Proposed Action through Reach 8 of the Final EIS would allow current channel characteristics to continue and allow additional habitats to potentially develop in the areas containing Ute ladies'-tresses colonies. Under proposed (baseline) operations of Jordanelle Reservoir, flood flows would occur over the floodplain every other year, and scouring flows would occur every 3 to 5 years, exposing gravels and depositing sediments that would provide additional Ute ladies'-tresses habitat — a combination that would improve the potential for Ute ladies'-tresses to disperse in this additional habitat. The periodic flooding would supply water to known colonies, thereby enhancing the probability for continued existence of the Ute ladies'-tresses colony. If monitoring of the Ute-ladies'-tresses colonies suggests that other flow regimes may be desirable to protect or promote establishment of colonies, the Mitigation Commission would cooperate with the FWS in requesting consideration of such requests by the CUWCD, USBR, PRWUA and other involved entities in accordance with the Deer Creek-Jordanelle Operating Agreement (USDOI 1994). Wetland enhancement at the proposed wetland mitigation sites (see Section 3.19.2.3) would improve the potential for dispersal of Ute

ladies'-tresses by providing additional and more suitable habitat.

An annual monitoring program would be designed to document site conditions, development of new habitat, and the status of the Ute ladies'-tresses colonies during the optimum blooming period, which varies year-to-year. These efforts would be coordinated with the proposed wetland mitigation monitoring described in Section 3.19.2.

3.19.3.2 Spotted Frog

The Mitigation Commission organized an interagency/interdisciplinary group to assist them in developing recommendations to avoid, reduce and/or to mitigate adverse impacts to spotted frogs which might be caused during construction of the PRRP. This group, referred to as the Spotted Frog Advisory Team, developed a list of recommendations, all of which have been adopted by the Mitigation Commission (see Appendix H). The final project plan for the Proposed Action in the Final EIS has been adjusted to avoid and reduce potential short-term adverse impacts to spotted frogs in the Project Area. The Proposed Action main channel alignment has been altered from the Draft EIS in Reaches 7, 8 and 9, primarily to avoid impacts to spotted frog habitats and reduce the amount of wetland impacts and required mitigation (refer to Map A-1 in the pocket at back of EIS). In addition, the Mitigation Commission will construct 4 ponds, about 0.15 acre in size, on federal property acquired by the Mitigation Commission in Reach 7, that will be suitable for over winter survival of spotted frogs. The Mitigation Commission will cooperate with USBR, CUWCD and others to develop a permanent water supply for a small portion of the USBR wetland mitigation area (cells N8 through N18) to provide suitable over winter habitat for spotted frogs. Excavation of deep areas within some of the cells to replace habitats impacted by construction of the Proposed Action would be completed prior to disturbance of the occupied habitats. The Mitigation Commission will cooperate with UDWR and others to design and construct the replacement deep water areas to replicate or mimic features removed by the project. The Mitigation Commission will evaluate the use of the replacement habitats for at least 2 years in accordance with a monitoring plan be developed with input from UDWR and the BBCRT.

Final design measures would further avoid and minimize impacts on the spotted frog to the maximum extent possible. Proposed wetland restoration and project construction methods, including trapping and relocation of spotted frogs from construction areas under the SOPs (see Chapter 1, Section 1.9.6.1) are expected to fully replace spotted frog habitat that would be impacted by construction of the PRRP alternatives and to reduce the likelihood of direct mortality or disruption by construction equipment. Additional measures would be developed if wetland restoration did not meet habitat needs. These methods are discussed in more detail later in this section. A detailed, long-term monitoring plan also would be designed and implemented in conjunction with wetland mitigation monitoring and with the Bonneville Basin Conservation and Recovery Team (BBCRT) and its technical advisors. The plan would include measures to determine the success of habitat recovery after disturbance, re-population of the restored area and relocation efforts. All potential mitigation measures would be finalized with the FWS and UDWR.

Spotted frog habitat in emergent marsh, open water and wet meadow areas within the area of impact would be inventoried to more accurately identify occupied areas before construction. Surveys for egg masses would be conducted in early April during the year construction is scheduled. Surveys would be conducted in summer and fall to locate other life stages of spotted frogs. Results of these surveys and records of known spotted frog locations would be used to guide appropriate conservation measures. Impacts on spotted frogs could be minimized by restricting construction activities during certain periods in areas that are known to be occupied by spotted frogs. Frog activity in occupied habitats occurs from hibernation in October to transformation of most tadpoles into adult frogs. Also, barriers would be placed around the construction site to prevent spotted frogs from entering, and protocols would be developed for relocating frogs that are discovered in the area during construction in consultation with the BBCRT and its advisors (see SOPs in Section 1.9.6.1 of Chapter 1). Orange fencing would be installed to prevent construction equipment from unnecessarily entering occupied habitat. Occupied areas near construction zones would be posted with signs stating "Conservation Area - Do not disturb."

This conservation measure would avoid disturbance of reproduction and minimize the loss of egg masses and tadpoles. In addition, it would avoid the mortality of immobile, hibernating individuals that would not be able to escape from construction equipment.

Direct effects on spotted frogs would be minimized by conducting rescue and relocation of adult frogs prior to starting construction and constructing a barrier or fence between the construction corridor and adjacent undisturbed habitat. Spring surveys would be conducted to determine if egg masses are present or absent. A protocol would be developed to guide these efforts in cooperation with DWR and the BBCRT and its advisors and the conditions and objectives of a Spotted Frog Conservation Agreement when it is prepared and approved for implementation. Adult frogs would be collected from the immediate area and transferred to the adjacent habitat during the late summer and fall months. The construction area would be fenced with silt fencing high enough to prevent re-entry of frogs during construction. The silt fencing would remain in place until the habitat is restored. After construction and restoration are complete, the barrier would be removed to allow frogs to return to the site. Rescue and relocation of frogs would minimize effects on the population. It is important to note that the success of frog relocation would be uncertain since monitoring has rarely been implemented to determine success of past relocation efforts. Some evidence suggests that ranid frogs imprint on their neonatal habitat and may attempt to return to hatching areas. Sites designated to receive relocated frogs would be selected with input from the FWS, UDWR and other BBCRT participates. Habitat conditions of spotted frogs would be enhanced where necessary.

3.19.4 Cultural Resources

Before construction, a complete inventory of prehistoric and historic resources would be completed at all sites in the impact area of influence where disturbances would occur to identify potentially significant impacts on cultural resources. The inventory would be conducted in accordance with the Programmatic Agreement (PA) that has been finalized among the DOI, the Mitigation Commission, Utah State Historic Preservation officer, and the Advisory Council on Historic Preservation (see Appendix F). The PA will ensure that all potentially significant impacts on cultural resources are identified, eligibility is determined for National Register of Historic Places and appropriate mitigation is implemented. Potential impacts on sites eligible for the National Register of Historic Places would be mitigated through HABS/HAER documentation, excavation or other measures deemed appropriate.

Paleontological inventory would be conducted in the impact area of influence where the fossil record potentially exists. Fossils would be collected or sampled if located, and monitoring of excavation work by a paleontologist would be required in critically sensitive localities.

3.20 Unavoidable Adverse Impacts

3.20.1 Introduction

This section describes unavoidable adverse impacts that would occur under the Proposed Action (Riverine Habitat Restoration) and alternatives. These impacts, presented by resource in the sections below, are adverse impacts that remain after mitigation.

There would be no unavoidable adverse impacts under the Proposed Action and alternatives for the following resources since they either did not have any adverse impacts or no adverse impacts remained after mitigation.

- Water resources
- Wetlands
- Aquatic resources
- Wildlife resources

3.20.2 Water Quality

TSS and TP concentrations in the Provo River, and subsequent loads to Deer Creek Reservoir, would increase slightly during and immediately after construction and decrease slightly after construction and fencing of acquired lands. Temperatures in the river would increase after construction, then decrease to baseline levels, or lower, as riparian vegetation becomes re-established and provides more shade over the water's surface.

3.20.3 Threatened and Endangered Species

Construction is likely to temporarily displace roosting and perching bald eagles. Under the PRRP alternatives, construction could cause some mortality and reduced reproductive success of spotted frog adults, tadpoles and egg masses even with the conservation measures and SOPs. Short-term impacts may also occur to Ute ladies'-tresses habitat due to the Proposed Action and Existing Channel Modification Alternative.

3.20.4 Soil Resources

Streambeds and streambanks would experience minor erosion during and immediately after construction.

3.20.5 Mineral and Energy Resources

Spoil material created during construction would be deposited at an existing excavation site, and fuel would be used by construction vehicles during construction and by recreationists' vehicles after construction.

3.20.6 Air Quality

Nitrogen oxides, sulfur oxides and particulate matter from vehicle emissions would increase during and after construction as recreationists drive to the Provo River. Dust emissions would increase during construction.

3.20.7 Agriculture Resources

Individual farming operations would have to alter agricultural practices because of the permanent loss of grazing land and cropland, and related restrictions on crossing the Provo River with vehicles and equipment, modifications to irrigation systems, and changes in cultivation and local access.

3.20.8 Socioeconomics

Farm revenue and income would decrease because of the temporary and permanent disturbance of grazing and crop land under the Proposed Action and Existing Channel Modification Alternative. Some farmers, local residents and property owners would be adversely impacted during and after construction along the Provo River because private property would be acquired under the PRRP.

3.20.9 Health and Safety

There would be a minor increase in the risk of traffic accidents for motorists driving near construction traffic and then after construction as more recreationists drive to access points along the Provo River. Frequency of overbank flood flows also would increase along the Provo River, but flood flows would be contained within setback dikes or by natural topographic features at the margin of the 100-year floodplain. The increased number of recreationists and children visiting the river also would cause a minor increase in the risk of drowning.

3.20.10 Noise

Noise levels would exceed significance criteria for people within about 50 feet of construction sites. Some people would experience significant noise impacts during construction along smaller roads in the impact area of influence that are not traveled by large trucks under baseline conditions. There would be additional noise impacts from recreationists' vehicles on roads along the Provo River.

3.20.11 Visual Resources

Vegetation and soil disturbance during construction would persist during the time required for regrowth of revegetated areas to a size comparable to the vegetation removed (about 2 to 7 years depending on vegetation type). Removal of cottonwood trees also would impact visual resources during the time required for re-growth of new trees to a size comparable to the ones removed (about 2 to 30 years).

3.20.12 Recreation

Restricted access to specific areas of the river and increased noise levels would reduce the quality of the recreation experience during construction.

3.20.13 Cultural Resources

Thorough surveys of cultural and paleontological resources in the impact area of influence have not been completed, so the location and extent of potential unavoidable adverse impacts on these resources is not known.

3.20.14 Transportation

Traffic would increase during construction and as recreationists drive to the Provo River corridor after construction. Two private bridges also would have to be reconstructed under the Proposed Action, which would result in minor delays or re-routing of traffic.

3.21 Cumulative Impacts

3.21.1 Introduction

This section describes cumulative impacts of the PRRP Proposed Action (Riverine Habitat Restoration) Existing Channel Modification Alternative, Instream Structures Alternative, and interrelated projects. The interrelated projects are identified and described in Chapter 1, Section 1.11.1. The PRRP Proposed Action does not impact any resources outside of Heber Valley, therefore the impact area of influence is limited to Heber Valley.

For the purposes of this analysis, only the portion of the Wasatch County Water Efficiency Project and Daniel Replacement Project which occurs in Heber Valley is considered as an interrelated project.

3.21.2 Cumulative Impacts Caused by the PRRP Proposed Action (Riverine Habitat Restoration) and Interrelated Projects

3.21.2.1 Water Resources

3.21.2.1.1 Past Projects. Past interrelated projects have caused the following cumulative impacts on surface water resources in Heber Valley:

- An increase in Provo River flows during spring and early summer from the Weber, Duchesne and Strawberry River transbasin diversions
- A decrease in flows in the upper and middle reaches of the Provo River and other Heber Valley streams during summer and fall. This is caused primarily by Heber Valley irrigation diversions. Flows in the lower portion of the Provo River are higher in the summer and fall than under natural conditions due to the return flow of ground water.
- A change in the volume and timing of downstream flows in the Provo River caused by Jordanelle Dam. In general, it has reduced high runoff flows in the spring and increased flows below the dam during summer and early fall when water supply demands are at their highest.
- Inundation of the Provo River in the lower portion of Heber Valley from the completion of Deer Creek Reservoir.

Groundwater levels in Heber Valley have risen in areas affected by flood irrigation. The greatest increases in groundwater levels have occurred in the area southeast of Heber City.

3.21.2.1.2 Future Projects. The PRRP Proposed Action has only a few impacts on water resources, thereby not causing any significant cumulative impacts with other interrelated projects. The major impacts on water resources from future projects would be caused by the WCWEP and DRP Proposed Action . The PRRP Proposed Action water resource impacts (increase of water travel time between Jordanelle Dam to Deer Creek Reservoir, and an increase of 40 acre-feet in net river channel seepage to groundwater) would not interact or add significantly to the impacts of the WCWEP and DRP Proposed Action. The WCWEP and DRP Proposed Action results in numerous changes to water resources such as: reduction in Jordanelle Reservoir and Deer Creek Reservoir storage levels, reduction in groundwater storage levels, increased flow in some streams, and lowering of the water level in some wells.

3.21.2.2 Water Quality

3.21.2.2.1 Past Projects. Past interrelated projects have affected water quality in Heber Valley. These activities included settlement of the valley and conversion of the natural environment to agricultural uses, and subsequently, residential and other urban development. These activities increased nonpoint source pollution and increased pollution from human waste. However, surface water quality conditions in Heber Valley and Deer Creek Reservoir have improved over the last 15 years. These improvements resulted from projects that addressed the point and nonpoint pollution sources in the valley, including the Rural Clean Water and Clean Lakes Programs, construction of a sediment settling

pond at the Midway Fish Hatchery and completion of the Heber Valley regional wastewater treatment plant. Operation of the Jordanelle Reservoir is improving water quality in Heber Valley canals and streams and Deer Creek Reservoir. These ongoing changes include reductions in sediment and phosphorus loads to Heber Valley (Sowby and Berg 1984). Additionally, Jordanelle Reservoir was constructed with a Selected Level Outlet Works (SLOW) to help protect downstream water quality by allowing water to be selectively discharged from different layers in the reservoir depending on water temperature.

3.21.2.2.2 Future Projects. During construction the PRRP Proposed Action and other interrelated projects such as the WCWEP and DRP Proposed Action would cause minor increases in nutrient and sediment concentrations in streams and canals during construction activities. The PRRP Proposed Action would cause a minor increase in the temperature of the Provo River. This impact would persist until riparian vegetation along disturbed portions of the Provo River is re-established and grows to a size and height that shades the water surface, approximately 15 to 30 years for cottonwood trees. These projects would cause increases in TSS loads during and immediately following construction in Deer Creek Reservoir.

After construction and revegetation of the disturbed area these projects would cause long-term decreases in nutrient and sediment concentrations. They would result in long-term decreases in TSS loads to Deer Creek Reservoir. The WCWEP and DRP Proposed Action and interrelated projects would improve, or have no influence on TP loads to Deer Creek Reservoir, and the net cumulative impact would be a decrease in baseline TP loads. This would result in a minor reduction, or no change in reservoir TP concentrations. There would be no cumulative impacts on temperature and mixing status in Deer Creek Reservoir from the PRRP Proposed Action and interrelated projects.

Future urban development in Heber Valley may create additional non-point source pollution. A study by Hansen, Allen, and Luce (1994) estimates that urban growth in the valley will increase groundwater nitrate concentrations by 10 percent. This increase would not cause nitrate concentrations to approach or exceed the State drinking water standard of 10 mg/L. The Heber Valley portion of the Tri-Valley Watershed Plan and expansion of the regional wastewater treatment plant would improve groundwater quality, while the PRRP Proposed Action and other projects would cause a minor increase in nitrate concentrations.

3.21.2.3 Wetlands

3.21.2.3.1 Past Projects. Past modifications to the Provo River channel have reduced riparian vegetation and other wetlands. While past urban and agricultural development in Heber Valley has adversely affected some wetlands, others have been created either directly or indirectly by flood irrigation for agriculture.

3.21.2.3.2 Future Projects. The PRRP Proposed Action and other interrelated projects are expected to mitigate all or most of the adverse wetlands impacts they cause. The PRRP Proposed Action and interrelated projects would cause an overall net gain of approximately 190.9 acres of wetlands. Some wet meadow wetlands that are not protected by the COE (referred to as "non-jurisdictional" wetlands) or the Wasatch County Planning Department may be directly or indirectly impacted in Heber Valley by future development projects without being mitigated.

3.21.2.4 Aquatic Resources

3.21.2.4.1 Past Projects. Past interrelated projects have caused a reduction in Heber Valley aquatic resources. The total trout population of Heber Valley has declined significantly.

3.21.2.4.2 Future Projects. The streamflow and habitat improvements of the PRRP Proposed Action and the WCWEP and DRP Proposed Action would cause an estimated increase in natural trout production of 26,114 pounds per year in the Provo River, and other Heber Valley streams.

Other cumulative impacts from future interrelated projects would include positive water quality impacts from the Heber Valley portion of the Tri-Valley Watershed Plan, and expansion of the regional wastewater treatment plant, and minor disturbance to the aquatic habitat of Creamery Ditch from the Highway 40 upgrade north of Heber City.

Future cumulative impacts on non-game fish and their habitat and other aquatic resources would generally be the same as for game fish (trout).

Improved streamflow and habitat restoration would cause a net increase in production of non-game fish that is not readily quantifiable.

3.21.2.5 Wildlife Resources

3.21.2.5.1 Past Projects. Past agricultural and urban development in Heber Valley has significantly reduced the habitat of the valley's native wildlife. Modifications in and along the Provo River channel, livestock grazing and irrigation diversions have reduced the amount of riparian wildlife habitat along the Provo River, London Ditch, Creamery Ditch, lower Lake Creek and Spring Creek.

3.21.2.5.2 Future Projects. The PRRP Proposed Action along with the WCWEP and DRP Proposed Action would cause a net increase of approximately 188.7 acres of wetland wildlife habitat in Heber Valley. Approximately 973 cottonwood trees along the Provo River would be removed during construction of the PRRP Proposed Action. Cumulative impacts would occur during the time required for revegetated areas and regenerated cottonwood trees to achieve a size and height that provide full wildlife habitat value. This varies from 2 to 3 years for emergent wetland vegetation, 5 to 10 years for willows and shrub understory vegetation and 15 to 30 years for cottonwood trees. An additional 310 acres of existing and undeveloped wildlife habitat would be permanently protected along the Provo River corridor.

The amount of wildlife habitat affected by two interrelated projects — the Highway 189 upgrade project and the Deer Creek Dam/Highway 189 buttressing project is not readily available. However, these two projects are expected to cause minor contributions to cumulative impacts since the work would occur in areas that do not currently provide important wildlife habitat. Future urban development in Heber Valley would adversely impact species that rely upon upland habitat and irrigated and non-irrigated agricultural lands.

3.21.2.6 Threatened and Endangered Species

3.21.2.6.1 Past Projects. Past agricultural and urban development and modifications to the Provo River channel in Heber Valley have greatly reduced the habitat of Ute ladies'-tresses, spotted frog, peregrine falcon and bald eagle. Past water development projects on the Provo River, including Deer Creek Reservoir, have adversely affected the June sucker by decreasing flows in the lower Provo River during their spawning and rearing period. These past impacts have led to the baseline habitat conditions described in Section 3.7.5.

3.21.2.6.2 Future Projects. The following subsections describe future cumulative impacts that could be caused by the PRRP Proposed Action and interrelated projects. The June sucker is not included in the following discussion because the PRRP Proposed Action and WCWEP and DRP Proposed Action would not affect this species. The cumulative impact on June sucker from the Provo River Project and the CUP Bonneville Unit is and will be addressed in the Provo River Project and SFN Biological Opinions.

Peregrine Falcon. The PRRP Proposed Action and WCWEP and DRP Proposed Action, and Highway 40 upgrade would cause the following temporary and permanent cumulative impacts on the foraging habitat of peregrine falcons:

The projects would cause temporary disturbance of 24.3 acres of peregrine falcon foraging habitat. This impact would last until the disturbed areas are revegetated.

The projects would result in a permanent loss of 83.0 acres of foraging habitat as a result of construction of project features and from groundwater level changes which affect wetland habitat.

However, with the enhancement and creation of new habitat, the projects would result in a net increase of 32.8 acres of foraging habitat for the Peregrine Falcon.

Additional foraging habitat would likely be directly or indirectly impacted in Heber Valley and near Jordanelle Reservoir as planned subdivisions, hotels and other development projects are built on undeveloped or agricultural land.

Bald Eagle. Bald eagle would experience minor, temporary and adverse cumulative impacts as they are disturbed by noise and the loss of trees used for roosting and perching during the construction of the PRRP Proposed Action, WCWEP and DRP Proposed Action, Highway 40 upgrade, and Deer Creek Dam buttressing project. These impacts

would be temporary and would last approximately 15 to 30 years until trees are mature and reach an adequate size after construction. About 13.3 acres of riparian woodland and 973 mature cottonwood trees would be permanently removed in Heber Valley. The level of adverse impacts would not induce bald eagle to winter elsewhere or cause excess stress that would affect the health of individuals because the impact area of influence does not support large concentrations of bald eagle, and other habitat is available during displacement.

Bald eagles would benefit from the long-term impacts of the PRRP and WCWEP and DRP and DRP Proposed Actions, Tri-Valley Watershed Plan, and expansion of the regional wastewater treatment plant in Heber Valley. All of these projects would increase fish populations and/or improve water quality and riparian habitats. The PRRP Proposed Action would cause a net increase of approximately 237.7 acres of riparian woodland with wetland mosaic that would provide roosting and perching habitat for bald eagles.

Ute Ladies'-tresses. The only known populations of the orchid that could be affected by the PRRP Proposed Action and other projects are found near the Provo River in Heber Valley. These populations would be protected during construction of the PRRP Proposed Action. No know colonies would be directly impacted by the PRRP Proposed Action or any of the interrelated projects.

Construction and operation of the projects would result in a permanent loss of 100.2 acres of unoccupied marginal habitat. This loss would result from construction of project facilities and a lowering of groundwater levels by the WCWEP and DRP Proposed Action. Construction would also result in the temporary loss of 28.2 acres of unoccupied marginal habitat (until the area is revegetated) for a period of two years. However, the projects would result in a gain of 279.3 acres for a net increase in habitat of 179.1 acres.

Additional irrigation-induced wetlands providing marginal Ute ladies'-tresses habitat in Heber Valley could be directly or indirectly impacted as subdivisions and other residential development projects are built on lands that are currently irrigated for agricultural purposes.

Spotted Frog. None of the interrelated projects are expected to impact spotted frog habitat. Therefore, no additional impacts beyond those described in Section 3.7.6.3.4 would occur. The PRRP Proposed Action would result in a net gain of 28.1 acres of habitat.

3.21.2.7 Soil Resources

3.21.2.7.1 Past Projects. Past Provo River modifications, and agricultural and urban development in Heber Valley has caused some soil erosion in the valley as well as lost of soil for productive use.

3.21.2.7.2 Future Projects. All of the future interrelated projects listed in Chapter 1, Section 1.11.1 and the PRRP Proposed Action have the potential to cause some erosion during and immediately after construction. During operation, there would be a gradual decrease in erosion potential and a net reduction in streambed erosion in the Provo River and the streams affected by the Tri-Valley Watershed Plan.

3.21.2.8 Mineral and Energy Resources

3.21.2.8.1 Past Projects. The use of energy and mineral resources has increased in Heber Valley in direct proportion to the amount of urban and agricultural development that has occurred in the valley.

3.21.2.8.2 Future Projects. Future energy use by vehicles and equipment during construction and operation of the PRRP Proposed Action and interrelated projects would cause cumulative impacts on energy resources. A total of about 294,200 gallons of fuel would be used during construction. Approximately 202,900 gallons of fuel would be used during the overlap in construction schedules of the PRRP Proposed Action and WCWEP and DRP Proposed Action. About 3 million KWhr/year of electricity would be used to run the WCWEP and DRP Proposed Action pump stations and to pump groundwater a greater distance during operation. Additional gasoline would be used by recreationists in the impact area of influence after construction.

The UDOT projects planned for Highway 189 in the Provo River canyon and Highway 40 in Heber Valley may require local borrow material and would use energy during construction. Depending on the material requirements and timing of construction, these projects could affect the same gravel mining

operations that would be affected by the PRRP and WCWEP and DRP Proposed Actions. The specific cumulative impacts on mineral and energy resources from these interrelated projects is not readily quantifiable.

3.21.2.9 Air Quality

3.21.2.9.1 Past Projects. While Heber Valley's air quality is generally very good, it has been degraded by past agricultural and urban development. Past development has led to an increase in vehicle emissions, dust and smoke from agricultural practices and smoke from fireplaces and wood stoves. Increased recreational use in and adjacent to the valley has also led to an increase in traffic and emissions.

3.21.2.9.2 Future Projects. Future UDOT highway upgrade projects, urban development in Heber Valley, the PRRP Proposed Action, and the WCWEP and DRP Proposed Action could cause future cumulative air quality impacts. Construction of the Highway 40 and 189 upgrades would increase traffic and vehicle emissions. The early phases of these upgrades would likely occur simultaneously with the PRRP and WCWEP and DRP Proposed Actions. Future urban development in Heber Valley and related population growth would likely increase vehicle emissions in the valley and degrade its air quality. Data necessary for quantifying the contribution of UDOT projects and future urban development to cumulative air quality impacts in Heber Valley are not readily available.

During the overlap in the construction of the PRRP Proposed Action and the WCWEP and DRP Proposed Action the maximum vehicle emissions during any twelve months of construction would be a total of 230 tons of nitrogen oxides, 30 tons of sulfur oxides, and 16 tons of particulates. After construction of the PRRP Proposed Action and WCWEP and DRP Proposed Action is completed, cumulative air quality impacts in Heber Valley would be caused by the vehicles of recreationists and cumulative impacts in the Provo River canyon would be caused by both of these projects and the latter phases of the UDOT Highway 189 upgrade.

3.21.2.10 Agriculture Resources

3.21.2.10.1 Past Projects. Agricultural production in Heber Valley has increased over time and approximately 12,800 acres in the valley are currently irrigated for agricultural purposes. Additional lands in the valley and surrounding uplands are used for grazing. Recent urban development has taken some land out of production and planned subdivisions are expected to cause additional adverse impacts on agriculture.

3.21.2.10.2 Future Projects. During the construction phase of the PRRP Proposed Action and interrelated projects temporary impact on agriculture production from disturbance of agricultural land would occur.

The construction of project facilities would result in the permanent removal of 325 acres of land, primarily used for grazing. This represents a 2.5% loss of irrigated land. The gross AUM production loss would be 1,916. However, the WCWEP and DRP Proposed Action would result in an increase in production of 2,001 AUMs, resulting in a net increase of 85 AUMs.

Implementation of the WCWEP and DRP Proposed Action and the Heber Valley portion of the Tri-Valley Watershed Plan would result in a long-term increase in crop yields, primarily because of the conversion from flood to sprinkler irrigation and other actions that provide more efficient agricultural practices and operations. The Highway 40 upgrade and expansion of the regional wastewater plant also would cause permanent removal of a minor amount of agricultural land.

3.21.2.11 Socioeconomics

3.21.2.11.1 Past Projects. The economy of Heber Valley and Wasatch County has grown over time from agricultural development and more recently, a boom in the real estate and housing markets. A recent influx of new residents is expected to continue and this demographic change is behind an ongoing change in social conditions for the valley's residents.

3.21.2.11.2 Future Projects. Future cumulative employment, revenue and income impacts would occur during the simultaneous construction of the PRRP Proposed Action, WCWEP and DRP Proposed Action and the Highway 40 upgrade. The cumulative and peak increase in construction-related employment caused by these 3 projects would be approximately 190 jobs. The PRRP Proposed

Action and the WCWEP and DRP Proposed Action (WCWEP and Daniel Replacement Pipeline) would cause some reduction in gross farm revenues during construction as land is removed from production. This loss would only be for one season. The cumulative and peak annual increase in total Wasatch County revenue during construction would be approximately 3.1 million dollars.

After construction, there would be a cumulative net increase of about $117,466 in total annual gross revenue in the farm sector of Wasatch County's economy. The total increase in the county's gross revenue would be approximately 1.2 million dollars per year. This would lead to an increase in income, sales tax revenue and income tax revenue. Property tax revenues would drop about $56,167 per year as payments in lieu of taxes from the federal government begin on land that is currently private property. The PRRP Proposed Action could cause some significant and adverse impacts to farmers, local landowners and residents along the Provo River corridor.

The Heber Valley portion of the Tri-Valley Watershed Plan would help increase productivity of agricultural resources in Heber Valley, however the impacts of the Tri-Valley Watershed Plan on agricultural economics are not available. Future urban development in Heber Valley will continue to take agricultural land out of production but would benefit other sectors of the economy. Such development would continue to change social conditions in Wasatch County and raise property tax revenue for the County.

3.21.2.12 Health and Safety

3.21.2.12.1 Past Projects. Health and safety risks have increased in Heber Valley as traffic associated with past development has increased. Construction and operation of Deer Creek and Jordanelle Reservoirs have also increased the health and safety risks for people living in Heber Valley.

3.21.2.12.2 Future Projects. The PRRP Proposed Action and interrelated projects could combine to cause cumulative health and safety risks related to traffic increases. Each of these projects would increase traffic during their construction periods. The PRRP and WCWEP and DRP Proposed Actions would increase recreation-related traffic after their construction is completed. This would increase the risk of traffic accidents on roads that would experience cumulative traffic increases, i.e., Highways 80, 40 and 189 and smaller roads in Heber Valley. However, the risk would be minimal because none of these projects would cause large increases in traffic, and additional traffic would be dispersed over a fairly large area.

3.21.2.13 Noise

3.21.2.13.1 Past Projects. With the increase in urbanization and recreation use in and adjacent to Heber Valley, noise levels have risen. The valley has changed from a peaceful quiet rural setting to an urbanized setting.

3.21.2.13.2 Future Projects. Construction and operation of the PRRP Proposed and WCWEP and DRP Proposed Actions would cause an increase in noise levels during their construction phases. Other projects that could cause cumulative noise impacts are the Highway 189 upgrade in the Provo River canyon, expansion of the regional wastewater treatment plant and the Highway 40 upgrade north of Heber City. During the overlap in construction of these projects, cumulative noise impacts would occur as workers and equipment from the different projects would sometimes travel on the same roads, primarily Highway 40 in Heber Valley and Highway 189 in the Provo River canyon.

After construction, the PRRP and WCWEP and DRP Proposed Actions would cause cumulative noise impacts on and near roads that experience simultaneous increases in recreation traffic associated with both projects. This would likely occur on Highway 40 in Heber Valley and Highway 189 in the Provo River Canyon and Heber Valley as recreationists drive to the Provo River.

3.21.2.14 Visual Resources

3.21.2.14.1 Past Projects. The character of Heber Valley is changing rapidly. Past projects have changed the visual character of Heber Valley in areas affected by Provo River modifications, construction of Jordanelle and Deer Creek reservoirs, changes in agricultural practices, construction of new housing, and increased commercial development. However, most of the valley is still primarily open space with scenic vistas.

3.21.2.14.2 Future Projects. The PRRP Proposed Action and other future interrelated projects could cause cumulative impacts on visual resources. These projects include the Highway 40 upgrade north of Heber City, additional urbanization in Heber Valley, expansion of the regional wastewater treatment plant in Heber Valley, and the WCWEP and DRP Proposed Action . These projects could cause adverse visual cumulative impacts by generating dust from construction vehicles and equipment, and land and tree clearing during construction. After construction, adverse cumulative visual impacts would result from the addition of more man-made and urban features, such as houses, power lines and telephone poles, in a predominantly agricultural setting. Positive cumulative visual impacts would occur along the enhanced Provo River riparian corridor.

3.21.2.15 Recreation Resources

3.21.2.15.1 Past Projects. Past projects such as the construction of the Deer Creek and Jordanelle Reservoirs have increased the availability of recreation opportunities in Heber Valley. Road construction has improved access into the area, bringing additional recreation users. Overall, recreation use and opportunities have increased over the years in Heber Valley. However, stream fishing opportunities have decreased as a result of the construction of the reservoirs and the general deterioration of existing streams.

3.21.2.15.2 Future Projects. The PRRP and WCWEP and DRP Proposed Actions would result in increasing stream fishing opportunities and use in Heber Valley. These two actions have the potential to provide for an increase of 98,418 angler days per year.

3.21.2.16 Cultural Resources

3.21.2.16.1 Past Projects. Settlement of Heber Valley, past interrelated projects and vandalism have caused adverse impacts on the valley's historic and cultural resources. The exact amount of impact is not quantifiable.

3.21.2.16.2 Future Projects. Future cumulative impacts on cultural resources from the PRRP Proposed Action and interrelated projects are not quantifiable because the data base of known sites is incomplete and the extent and location of potentially affected cultural resources are unknown. Vandalism of historic sites could increase in Heber Valley as the valley's population increases.

3.21.2.17 Transportation

3.21.2.17.1 Past Projects. Traffic has increased in Heber Valley as the valley's population has grown, roadways have been improved, and as more visitors drive through the valley on their way to ski resorts, reservoirs and other recreation areas.

3.21.2.17.2 Future Projects. Construction of the PRRP Proposed Action, WCWEP and DRP Proposed Action, and the Highway 40 upgrade would cause cumulative traffic impacts on Highways 40 and 189 in Heber Valley during the overlap in their construction schedules. The peak, cumulative increase in traffic on Highway 40 may be approximately 520 daily trips and 259 daily trips on Highway 189.

These projects could also cause cumulative impacts during construction on Highway 189 in the Provo River canyon where workers and construction vehicles associated with the PRRP Proposed Action and the WCWEP and DRP Proposed Action , and Highway 189 upgrade would travel simultaneously. The peak cumulative increase in traffic related to construction workers could be as high as 1,046 trips a day during the height of construction. This is a worst-case scenario since it is not known if UDOT would encourage or require car pooling. The Highway 189 upgrades would cause delays to motorists who would need to wait for construction to be completed in the narrow canyon. However, the SOPs and mitigation measures included in the Highway 189 projects would likely minimize adverse impacts on motorists and minimize adverse cumulative impacts.

The increased recreation use associated with the PRRP Proposed Action and the WCWEP and DRP Proposed Action would increase recreation-related traffic on Heber Valley roads and on Highway 189 in the Provo River canyon. Fishermen and other recreationists would use Highways 40 and 189 to travel from the Provo/Orem and Salt Lake City areas to the Provo River, and other Heber Valley streams. The increase in recreation-related traffic would begin during the last three phases of the Highway 189 upgrade. However, the cumulative increase in traffic would be within the designed

capacity of the affected roads, and the SOPs and mitigation included in the last three phases of the Highway 189 upgrade would help avoid and minimize cumulative impacts in the Provo River canyon.

3.21.3 Cumulative Impacts Caused by the Existing Channel Modification Alternative and Interrelated Projects

This section describes cumulative impacts caused by the Existing Channel Modification Alternative and interrelated projects that would be different than those described for the PRRP Proposed Action and interrelated projects in Section 3.21.2.

3.21.3.1 Water Resources

Cumulative impacts on water resources under this alternative and interrelated projects would generally be the same as described for the PRRP Proposed Action in Section 3.21.2.1.2.

3.21.3.2 Water Quality

Cumulative water quality impacts would include slight increases in TSS and TP concentrations in affected streams during and immediately after construction of the Existing Channel Modification Alternative and interrelated projects. This alternative and interrelated projects would cause minor, temporary increases of TSS loads in the Provo River, and sediment inflow to Deer Creek Reservoir during and immediately after construction activities. TSS loads to Deer Creek Reservoir would decrease after site stabilization. There would be a decrease in baseline TP loads, and either no change or a decrease in Deer Creek Reservoir TP concentrations under this alternative and interrelated projects. Conditions that influence thermal stratification in Deer Creek Reservoir would not be impacted by this alternative and interrelated projects. However, TSS and TP concentrations would decrease to levels equivalent to or less than baseline conditions after construction site stabilization. The net result after construction would be a slight decrease in TSS and TP concentrations in the impact area of influence.

Minor increases in late-summer water temperatures in the Provo River and upper Rock Ditch would occur during the summer of dry years under this alternative and interrelated projects. However, this increase would not exceed any water quality parameters. The impact of increased water temperature would persist for about 15 to 30 years, which is the time required for cottonwoods to be re-established along streambanks at a size and height that would shade the water surface in a manner similar to baseline conditions.

3.21.3.3 Wetlands

The net gain of wetlands caused by the Existing Channel Modification Alternative and WCWEP and DRP Proposed Action would be approximately 58.1 acres. Wetlands would increase along the Provo River in Heber Valley.

3.21.3.4 Aquatic Resources

The streamflow and habitat improvements of the Existing Channel Modification Alternative and the WCWEP and DRP Proposed Action would cause a cumulative increase of approximately 8,806 pounds of trout per year in the Provo River and other streams in Heber Valley.

3.21.3.5 Wildlife Resources

The Existing Channel Modification Alternative and the WCWEP and DRP Proposed Action would cause a net increase of approximately 58.1 acres of wildlife habitat along the Provo River in Heber Valley. Approximately 1,080 cottonwood trees along the Provo River would be removed during construction of the Existing Channel Modification Alternative. The time required for revegetation and re-establishment of newly developed areas to provide full wildlife habitat value would be the same as described for the PRRP Proposed Action in Section 3.21.2.5.2.

3.21.3.6 Threatened and Endangered Species

Peregrine Falcon. The Existing Channel Modification Alternative, WCWEP and DRP Proposed Action and Highway 40 upgrade would cause adverse and beneficial cumulative impacts on peregrine falcon foraging habitat. About 100.9 acres of foraging habitat would be temporarily disturbed. About 43.6 acres of foraging habitat would be permanently removed by these projects.

Bald Eagle. Cumulative impacts would be the same as described for this alternative in Section 3.7.6.4.2 as none of the interrelated projects are known to affect Bald Eagles.

Ute Ladies'-tresses. The Existing Channel Modification Alternative and WCWEP and DRP Proposed Action would temporarily disturb 116.8 acres of potential habitat, and permanently remove 83.8 acres of potential habitat. About 141.9 acres of potential habitat would be developed along the Provo River corridor.

Spotted Frog. Cumulative impacts would be the same as described for this alternative in SectionÊ3.7.6.4.4

3.21.3.7 Soil Resources

The types of cumulative impacts on soil resources caused by this alternative and interrelated projects would generally be the same as described for the PRRP Proposed Action in Section 3.21.2.7. However, some of the impacts would occur in different locations.

3.21.3.8 Mineral and Energy Resources

A total of about 257,900 gallons of fuel would be used during construction of the Existing Channel Modification Alternative and the WCWEP and DRP Proposed Action . About 189,900 gallons of fuel would be used during the two-year overlap in construction of this alternative and the WCWEP and DRP Proposed Action.

3.21.3.9 Air Quality

The maximum vehicle emissions during any 12-month period of the overlap in construction of the Existing Channel Modification Alternative and WCWEP and DRP Proposed Action would be 228 tons of nitrogen oxides, 20 tons of sulfur oxides, and 17 tons of particulates. There would be fewer cumulative air quality impacts after construction under this alternative since it would attract less recreation-related traffic than the PRRP Proposed Action .

3.21.3.10 Agriculture Resources

Construction of the Existing Channel Modification Alternative and interrelated projects would cause a temporary impact on agriculture production from disturbance of agricultural land.

The construction of project facilities would result in the permanent removal of 19 acres of land, primarily used for grazing. The gross AUM production loss would be 52. However, the WCWEP and DRP Proposed Action would result in an increase in production of 2,001 AUMs, resulting in a net increase of 1,949 AUMs.

Implementation of the WCWEP and DRP Proposed Action and the Heber Valley portion of the Tri-Valley Watershed Plan would result in a long-term increase in crop yields, primarily because of the conversion from flood to sprinkler irrigation and other actions that provide more efficient agricultural practices and operations. The Highway 40 upgrade and expansion of the regional wastewater plant also would cause permanent removal of a minor amount of agricultural land.

3.21.3.11 Socioeconomics

Future cumulative employment, revenue and income impacts would occur during the simultaneous construction of the Existing Channel Modification Alternative, WCWEP and DRP Proposed Action (WCWEP and Daniel Replacement Pipeline), and Highway 40 upgrade. The cumulative and peak increase in construction-related employment caused by these 3 projects would be approximately 189 jobs. Gross revenue in the construction and retail trade sectors would increase. The cumulative and peak annual increase in total Wasatch County revenue during construction would be approximately 2.3 million dollars.

After construction, there would be a cumulative net increase of about $130,521 in total annual gross revenue in the farm sector of Wasatch County's economy. The total increase in the county's gross revenue would be approximately $715,420 per year. This would lead to an increase in income, sales tax revenue and income tax revenue. Property tax revenues would drop about $55,280 per year as payments in lieu of taxes from the federal government begin on land that is currently private property.

3.21.3.12 *Health and Safety*

The cumulative increase in traffic-related hazards under the Existing Channel Modification Alternative would be slightly less than the same type of hazards associated with the PRRP Proposed Action since this alternative would cause smaller traffic increases during or after construction.

3.21.3.13 *Recreation Resources*

The Existing Channel Modification Alternative and the WCWEP and DRP Proposed Action would cause a net increase in recreational fishing of 31,302 angler days per year.

3.21.3.14 *Transportation*

This alternative and interrelated projects would cause the same type of cumulative impacts on transportation resources as the PRRP Proposed Action and described in Section 3.21.2.17. The magnitude of the future cumulative impacts during construction would be the same as the PRRP Proposed Action on Highway 40 in Heber Valley and Highway 189 in the Provo River canyon. The future cumulative impacts on Highway 189 in Heber Valley would be slightly higher (approximately 3 more trips per day during the peak of construction). Cumulative traffic impacts after construction would be less than those associated with the PRRP Proposed Action since this alternative would attract fewer recreationists to the Provo River in Heber Valley.

3.21.4 Cumulative Impacts Caused by the Instream Structures Alternative and Interrelated Projects

This section describes cumulative impacts caused by the Instream Structures Alternative and interrelated projects that would be different than those described in Section 3.21.3 for the Existing Channel Modification Alternative.

3.21.4.1 *Water Resources*

The Instream Structures Alternative would not impact water resources, therefore no cumulative impacts would occur.

3.21.4.2 *Water Quality*

The cumulative water quality impacts of this alternative and interrelated projects would be generally the same as the Existing Channel Modification Alternative described in SectionÊ3.21.3.2. However, there would not be a change in Provo River water temperatures.

3.21.4.3 *Wetlands*

Future cumulative impacts on wetlands from this alternative and interrelated projects would be a net loss of approximately 20.7 acres. Since the Instream Structures Alternative would not impact wetlands, cumulative wetland impacts would be the same as those caused by the WCWEP and DRP Proposed Action alone.

3.21.4.4 *Aquatic Resources*

The streamflow and habitat improvements caused by the Instream Structures Alternative and the WCWEP and DRP Proposed Action would cause an increase in natural trout production of 3,978 pounds of trout per year. These positive impacts would occur in the Provo River and other streams in Heber Valley.

3.21.4.5 *Wildlife Resources*

The Instream Structures Alternative would not impact any wildlife habitat or resources so there would be no cumulative impacts.

3.21.4.6 *Threatened and Endangered Species*

The Instream Structures Alternative would not cause adverse impacts on threatened and endangered species, other than some temporary and minor disturbances to bald eagles during construction.

Bald eagles would benefit from an increase in trout populations in the Provo River under this alternative. Therefore, cumulative impacts on threatened and endangered species from the Instream Structures Alternative and interrelated projects would primarily be limited to those caused by the interrelated projects, as described in SectionÊ3.21.3.6.

3.21.4.7 Mineral and Energy Resources

About 155,600 gallons of fuel would be used during the concurrent construction of the Instream Structures Alternative and WCWEP and DRP Proposed Action.

3.21.4.8 Air Quality

The maximum vehicle emissions during any 12-month period of construction of the Instream Structures Alternative and WCWEP and DRP Proposed Action would be 173 tons of nitrogen oxides, 15 tons of sulfur oxides, and 13 tons of particulates. Fewer cumulative air quality impacts would occur under this alternative after construction since it would attract less recreation-related traffic than the PRRP Proposed Action or Existing Channel Modification Alternative.

3.21.4.9 Agriculture Resources

The Instream Structures Alternative would not impact agricultural resources so there would be no cumulative impacts.

3.21.4.10 Socioeconomics

Cumulative employment, revenue and income impacts would occur during the simultaneous construction of the Instream Structures Alternative, the WCWEP and DRP Proposed Action (WCWEP and Daniel Replacement Pipeline), and Highway 40 upgrade. The cumulative and peak increase in construction-related employment caused by these 3 projects would be approximately 156 jobs. Gross revenue in the construction and retail trade sectors would increase. The cumulative and peak annual increase in total Wasatch County revenue during construction would be approximately $758,887.

After construction the county would experience an annual increase in gross revenue of about $104,000; therefore, the total increase in the county's gross revenue would thus be approximately $693,691 per year. The Existing Channel Modification Alternative would not require the purchase of any land, so no cumulative impact on property taxes would occur.

3.21.4.11 Health and Safety

The cumulative risk of traffic accidents would be lowest under this alternative since it would cause a lower increase in traffic during or after construction than the PRRP Proposed Action or Existing Channel Modification Alternative.

3.21.4.12 Recreation Resources

The Existing Channel Modification Alternative and the WCWEP and DRP Proposed Action would cause a net increase of 12,914 angler days per year of recreational fishing.

3.21.4.13 Transportation

During their construction periods, this alternative and interrelated projects would cause a cumulative peak of 468 daily trips on Highway 40 in Heber Valley, 1,032 peak daily trips on Highway 189 in the Provo River canyon, and 232 peak daily trips on Highway 189 in Heber Valley. Cumulative traffic impacts after construction would be less than those associated with the PRRP Proposed Action since this alternative would attract fewer recreationists to Heber Valley.

3.22 Irreversible and Irretrievable Commitment of Resources

3.22.1 Introduction

This section describes the irreversible and irretrievable commitment of resources and the potential for conservation that would occur under the Proposed Action (Riverine Habitat Restoration) and alternatives. All references to the Proposed Action in this subsection refer to the PRRP Riverine Habitat Restoration, which is referred to as the Proposed Action in this subsection.

There would be no irreversible and irretrievable commitment of resources under the Proposed Action and alternatives for the following resources:

- Water resources
- Water quality
- Wetlands
- Aquatic resources
- Wildlife resources

- Threatened and endangered species
- Soil resources
- Air quality
- Health and safety
- Noise
- Visual resources
- Recreation resources
- Cultural resources
- Transportation

3.22.2 Proposed Action (Riverine Habitat Restoration)

Materials used during construction of the Proposed Action would be permanently committed to the project. Table 1-16 in Section 1.9 of the PRRP FEIS lists materials to be used during construction.

Construction of the Proposed Action would require 142,600 gallons of gasoline for vehicles and equipment. Additional recreational traffic after construction would use more fuel, but the amount is not readily quantifiable.

Some existing, irrigated and non-irrigated agricultural lands would be permanently removed during construction the Proposed Action, including 26 acres of grazing land and 288 acres of irrigated pasture and cropland.

Funds used for construction and operation of the Proposed Action will be permanently committed to the project and not be available for other purposes. Table 1-17 in Section 1.9.5 of the PRRP EIS shows estimated construction and operation costs.

3.22.3 Existing Channel Modification Alternative

The irreversible and irretrievable commitment of resources under the Existing Channel Modification Alternative would be generally similar to the discussion in Section 3.22.2 for the Proposed Action (Riverine Habitat Restoration).

Construction of the this alternative would require 106,300 gallons of gasoline for vehicles and equipment. Additional fuel would be used for increased recreational traffic after construction, but the amount is not readily quantifiable.

Some existing irrigated and non-irrigated agricultural lands would be permanently removed during construction the Proposed Action, including 7.6 acres of irrigated pasture and cropland.

3.22.4 Instream Structures Alternative

The irreversible and irretrievable commitment of resources under the Instream Structures Alternative would be generally similar to the discussion in Section 3.22.2 for the Proposed Action (Riverine Habitat Restoration), except no agricultural lands would be permanently removed.

This alternative would use about 13,106 cubic yards of gravel from an existing, off-site borrow source for construction.

Construction of this alternative would require about 4,000 gallons of gasoline for vehicles and equipment. Increased recreational traffic after construction would use additional fuel, but the amount is not readily quantifiable.

Provo River
Restoration Project

CHAPTER 4

Consultation and Coordination

Final Environmental Impact Statement

Chapter 4
Consultation and Coordination

4.1 Introduction

This chapter describes the consultation and coordination for the Provo River Restoration Project (PRRP) Environmental Impact Statement (EIS). It summarizes the consultation and coordination that was undertaken in the development of the Proposed Action and alternatives, the scoping process and results of scoping meetings, identifies the agencies and organizations consulted, and describes the results of the public review process on the Draft EIS.

The Mitigation Commission initiated and managed the consultation and coordination for the PRRP EIS. Agencies, organizations and technical experts were requested by the Mitigation Commission to participate on committees and review proposed project plans, the environmental analysis and EIS documentation.

4.2 Consultation

Consultation was conducted with agencies, organizations, local landowners, and technical experts throughout the formulation of the Proposed Action and alternatives, the environmental analysis, and preparation of the EIS. All of the technical and advisory committees included local representation from Wasatch County.

4.2.1 Agencies, Organizations and Technical Experts Consulted

The following subsections describe the significant consultation during development of the Proposed Action and the EIS.

4.2.1.1 PRRP Technical Advisory Committee

This committee first met on January 14, 1992 to begin project planning that evolved into the PRRP. Its purpose was to bring together the diverse interests of federal, state and local agencies, water users, local elected officials and interested organizations to discuss alternatives for restoring the Provo River between Jordanelle Dam and Deer Creek Reservoir. The committee continued its meetings on April 30, 1992; June 4, 1993; July 7, 1993; October 21, 1993; and March 9, 1994. Members also toured the Provo River on June 3, 1993 and conducted a design criteria workshop from July 6 through July 9, 1993. The following agencies and organizations and their representatives participated in the committee:

- U.S. Fish and Wildlife Service (FWS) — Leon Colborn
- U.S. Army Corps of Engineers (COE) — Katherine Trott
- U.S. Forest Service (USFS) — John Frandsen, Bob Hurley
- U.S. Geological Survey (USGS) — D. Michael Roark
- U.S. Bureau of Reclamation (USBR) — David Frandsen
- Utah Division of Wildlife Resources (UDWR) — Mark Holden, Doug Sakaguchi
- Utah Department of Natural Resources (UDNR) — Milo Barney
- Utah Division of Water Resources — Robert King
- Utah Division of Water Rights — Chad Gourley
- Wasatch Soil Conservation District — Claude Hicken, Jack Young
- Wasatch County Commission — Morroni Besendorfer
- Wasatch County — Bob Mathis
- Wasatch County Special Service Area (WCSSA) — LeeRoy Farrell
- Provo River Canals Commission — Robert Fillerup
- Midway City — Reed Bezzant
- Provo City Water Resources — Merril Bingham
- Municipal Water District of Salt Lake City — Nick Setakis
- Salt Lake County Water Conservancy District — David Ovard
- Utah Outdoor Interests Coordinating Council — Jeffrey Appel, Paul Dremann, Dan Potts, Darrell Mensel

- Provo River Water Users Association — Jack Gardner
- Wasatch County Water Users — George Holmes
- Summit County Water Users — Ed Lire
- Franson Noble — Rick Cox
- Inter-Fluve, Inc. — Scott Gillilan, Bob O'Brien
- Don Chapman Consultants — William Platts

A major workshop (Design Criteria Workshop) was held in July of 1993. This workshop involved participation of a number of organizations and individuals. A major feature of the workshop was a tour of the project area with appropriate land owners. Also, all the affected landowners were invited to attend a portion of the workshop and were given the opportunity to discuss their concerns directly with the project design team, and the PRRP Technical Advisory Committee. A number of design criteria and study procedures were formulated as a result of the input received at this workshop. See Table 1-4 (Summary of Proposed Action (Riverine Habitat Restoration) Improvements) in Chapter 1.

4.2.1.2 Provo/Wasatch Planning Coordination Committee

This committee first met on January 21, 1992 to begin project planning. Its purpose was to bring together the diverse interests of federal, state and local agencies, water users, local elected officials and interested organizations to discuss how the provisions of the Central Utah Project Completion Act (CUPCA) could be met in Heber Valley. The committee continued its meetings on: February 6, 1992; April 2, 1992; April 8, 1992; May 5, 1992; and toured Heber Valley on September 29, 1993 and October 22, 1993. The following agencies and organizations and their representatives participated in the committee:

- FWS — Leon Colborn, Bob Freeman, Reed Harris
- EPA — Dave Ruiter, Wes Wilson
- COE — Katherine Trott
- USFS — Walt Hanks, Bob Hurley, Jim Percy, Robert Riddle
- NRCS — Todd Nielson, Marilyn O'Dell
- USBR — Bruce Barrett, Boyd Clark, David Frandsen, Rex Gabbitas, Jay Henrie, Fred Liljegren, Don Olsen, Bruce Snyder, Lee Swensen
- Utah Division of Wildlife Resources — John Fairchild, Mark Holden, Doug Sakaguchi, Charles Thompson
- UDNR — Milo Barney
- Utah Division of Water Resources — Robert King
- Utah Division of Water Rights — Chad Gourley, Bob Morgan, Jim Riley, Jerry Olds
- Utah Division of Parks and Recreation — T.E. Green, Willy Yu
- Utah DEQ — Rick James
- Wasatch County Commission — Morroni Besendorfer
- Wasatch County — Bob Mathis
- SLCWCD — Tage Flint
- UOICC — Jeffrey Appel, Paul Dremann, Dan Potts
- PRWUA — Jack Gardner, Richard Poulsen
- Wasatch County Water Users — Cal Muir

4.2.1.3 Fishery Technical Committee

This committee first met on March 3, 1992 to develop a field work plan. The committee continued meeting to review results of field data collection and analysis. The committee held additional meetings on the following dates: March 31, 1992; May 6, 1992; May 27, 1992; June 2, 1992; May 24, 1993; September 1, 1993; February 17, 1994; March 21, 1994; March 29, 1994; and May 26, 1994. The following agencies and organizations and their representatives participated in the committee:

- FWS — Leon Colborn
- COE — Katherine Trott
- USFS — Barbara Franano, Walt Hanks, Bob Hurley, Juan Spillet
- NRCS — Jan Anderson, Ralph Mickelson, Marilyn O'Dell, Robert Sennett
- Utah Division of Wildlife Resources — John Fairchild, Mark Holden, Doug Sakaguchi, Charles Thompson
- UDNR — Milo Barney
- Utah Division of Water Rights — Chad Gourley
- Utah Division of Parks and Recreation — T.E. Green
- Wasatch SCD — Claude Hicken, Jack Young
- WCSSA — LeeRoy Farrell

- Wasatch County Commission — Morroni Besendorfer
- Wasatch County — Kenley Brunsdale, Bob Mathis
- Midway City — John Anderson
- Midway Irrigation Company — Britt Mathwich, Elmer Wilson
- UOICC — Jeffrey Appel, Paul Dremann, Darrell Mensel, Dan Potts
- Wasatch County Water Users — George Holmes

4.2.1.4 Instream Flow Work Group

This work group was a subcommittee of the Fishery Technical Committee that was charged with determining which Heber Valley streams would receive supplemental instream flows under the Wasatch County Water Efficiency Project and Daniel Replacement Project, how much flow each stream would receive, and prioritizing the streams for instream flows. All streams that would receive instream flows are tributary to the Provo River. The work group first met on April 14, 1994 and held additional meetings on April 25, 1994; May 5, 1994; May 17, 1994; and January 10, 1995. The following agencies and organizations and their representatives participated in the committee:

- FWS — Leon Colborn
- NRCS — Jan Anderson
- Utah Division of Wildlife Resources — John Fairchild, Mark Holden, Doug Sakaguchi, Charles Thompson
- UDNR — Milo Barney
- Wasatch SCD — Jack Young
- WCSSA — LeeRoy Farrell
- Wasatch County Commission — Morroni Besendorfer
- UOICC — Paul Dremann, Dan Potts

4.2.1.5 Wetlands Technical Committee

This committee first met on October 23, 1991 to discuss how wetlands in Heber Valley would be potentially affected by the project that evolved into the PRRP. They developed and reviewed field study plans, evaluated data collected on wetland communities, and held preliminary discussions regarding mitigation for wetland impacts. The following additional meetings were held with the Wetlands Technical Committee: February 13, 1992; March 31, 1992; April 8, 1992; April 21, 1992; May 28, 1992; May 24, 1993; June 25, 1993; October 13, 1994; November 2, 1994; and February 8, 1995. The following agencies and organizations and their representatives participated in the committee:

- FWS — Leon Colborn, Bob Freeman
- COE — Brooks Carter, Katherine Trott, Michele Waltz
- USBR — Bruce Barrett, David Frandsen, Jay Henrie, Richard Jensen, Jonathan Jones, Christine Karas, Steven Lloyd, Bruce Moore, Barry Wirth
- EPA — Dave Ruiter
- USFS — Walt Hanks, Bob Hurley
- NRCS — Jan Anderson, Jana Johnston, Marilyn O'Dell, Robert Sennett
- Utah Division of Wildlife Resources — Larry Dalton, John Fairchild, Mark Holden, Catharine Quinn, Doug Sakaguchi, Charles Thompson
- UDNR — Milo Barney
- Utah Division of Water Rights — Chad Gourley
- Utah Division of Parks and Recreation — T.E. Green, Willy Yu
- Wasatch SCD — Jack Young
- WCSSA — LeeRoy Farrell
- Wasatch County Commission — Morroni Besendorfer
- Wasatch County — Kenley Brunsdale, Bob Mathis
- Midway City — John Anderson
- Midway Irrigation Company — Britt Mathwich, Elmer Wilson
- UOICC — Jeffrey Appel
- SLCWCD — Jeff Bryant
- Wasatch County Water Users — George Holmes

4.2.1.6 Water Quality Technical Committee

This committee first met on July 27, 1993 to discuss water quality aspects of the PRRP and the types of analyses that should be included in the EIS. Some committee members are on the Jordanelle Technical Advisory Committee (JTAC), which was formed by USBR to monitor water quality changes associated with construction and operation of Jordanelle Dam and Reservoir. The Water Quality Technical Committee held additional meetings on April 14, 1994; April 28, 1994; and January 11,

1995. The following agencies and organizations and their representatives participated in the committee:

- USBR — David Frandsen
- NRCS — Jan Anderson, Ralph Mickelson
- Utah Division of Wildlife Resources — Doug Sakaguchi
- Utah Division of Water Quality — Harry Lewis Judd
- Utah DEQ — Mike Reichert
- Wasatch SCD — Claude Hicken
- WCSSA — LeeRoy Farrell
- Wasatch County — Dennis Jensen, Bob Mathis
- Mountainland Association of Governments — Ray Loveless

4.2.1.7 Work Plan Reviews

Work plans were prepared by CUWCD and the Mitigation Commission for each resource analyzed in Chapter 3 of this EIS. Each work plan identified specific issues and concerns, impact topics, impact analysis methodology, significance criteria, data sources, dependency items with other resources, and included a Chapter 3 section outline. These work plans were distributed to agencies and organizations in July and August 1994 for review, comment and concurrence before CUWCD and the Mitigation Commission started the environmental analysis on any resource. The following agencies, organizations and their representatives received work plans for review as indicated:

- Department of the Interior (Ron Johnston) — all resources
- FWS (Leon Colborn) — Aquatic Resources, Threatened and Endangered (T&E) Species, Vegetation, Wetlands, Wildlife, Water Quality, Water Resources
- COE (Michele Waltz) — Aquatic Resources, Vegetation, Wetlands, Wildlife, Water Quality, Water Resources
- NRCS (Jan Anderson) — Agriculture, Soils, Vegetation, Wetlands, Water Quality, Water Resources
- EPA (Wes Wilson) — Air Quality, Health and Safety, Vegetation, Wetlands, Water Quality, Water Resources
- USFS (Bevan Killpack) — all resources
- Utah Division of Wildlife Resources (Milo Barney, Mark Holden) — Aquatic Resources, T&E Species, Vegetation, Wetlands, Wildlife, Water Quality, Water Resources
- Utah Division of Water Resources (Robert King) — Water Quality, Water Resources
- Utah Division of Water Quality (Mike Reichert) — Water Quality, Water Resources
- WCSSA (LeeRoy Farrell) — Agriculture, Soils, Vegetation, Wetlands, Water Quality, Water Resources
- UOICC (Jeffrey Appel) — all resources

4.2.1.8 Chapter 1 PDEIS Agency Review

Chapter 1 of the Preliminary Draft EIS (PDEIS) was distributed to agencies and organizations by CUWCD and the Mitigation Commission in July 1995 for review and comment. The purpose of this early review was to help the agencies and organizations and their representatives understand the Proposed Action and alternatives for the PRRP EIS as they reviewed the technical reports. A meeting was held on August 2, 1995 to present Chapter 1 and answer agency questions. A Chapter 1 agency and organization comment meeting was held on August 15, 1995. Written comments submitted to the CUWCD and the Mitigation Commission after the meeting were combined with verbal comments and incorporated into Chapter 1. The following agencies, organizations and their representatives participated in the Chapter 1 review:

- Department of the Interior — Ron Johnston, Reed Murray, Ralph Swanson
- FWS — Robert Benton, Leon Colborn, Lucy Jordan
- NRCS — Jan Anderson, Ralph Mickelson, Marilyn O'Dell
- USFS — Bevan Killpack, Deanna Nelson
- EPA — Wes Wilson
- COE — Michele Waltz
- Utah Division of Water Resources — Milo Barney, Norm Stauffer
- Utah Division of Water Rights — Ben Anderson
- Utah Division of Wildlife Resources — Doug Sakaguchi
- Wasatch SCD — Jack Young
- WCSSA — LeeRoy Farrell
- Wasatch County — Dan Matthews, Cal Muir
- UOICC — Jeffrey Appel

4.2.1.9 Technical Report Reviews and Consultation Meetings

Technical report reviews and consultation were conducted in a two-stage process. Pre-technical report meetings were held on August 2, 1995 for Water Resources and Water Quality, and on August 9, 1995 for Wetlands, Aquatic Resources and T&E Species. These meetings provided the agencies and organizations an opportunity to preview the content and key results of each report before it was released for review. Technical reports were distributed by CUWCD and the Mitigation Commission to agencies and organizations in October, November and December 1995 for review and comment. About two weeks after each technical report was distributed, CUWCD and the Mitigation Commission held a meeting to receive verbal comments, which were transcribed and sent to the agencies and organizations for concurrence. Written comments were received on technical reports about two weeks after the technical report meetings. Technical report comment meetings were held on November 6, 1995 (Water Resources); December 13, 1995 (Water Quality and Wetlands); and December 21, 1995 (Aquatic Resources and T&E Species).

The following agencies and organizations and their representatives participated in technical report reviews and consultation meetings:

- Department of the Interior — Reed Murray, Ralph Swanson
- FWS — Leon Colborn
- NRCS — Jan Anderson, Ralph Mickelson, Marilyn O'Dell, Robert Sennett
- USFS — Bevan Killpack
- COE — Michele Waltz
- Utah Division of Water Resources — Milo Barney
- Utah Division of Wildlife Resources — Gary Ogborn, Doug Sakaguchi
- Wasatch SCD — Jack Young
- WCSSA — LeeRoy Farrell
- UOICC — Jeffrey Appel

4.2.1.10 PDEIS Agency Review

The PDEIS was distributed to cooperating agencies and organizations by CUWCD and the Mitigation Commission on March 1, 1996 for review and comment. The CUWCD and the Mitigation Commission requested the cooperating agencies and organizations to submit formal written comment on the PDEIS by March 27, 1996. Comments on the PDEIS received from the cooperating agencies and organizations were used to prepare the Draft EIS. The following cooperating agencies and organizations participated in the PDEIS review:

- U.S. Department of the Interior
- U.S. Fish and Wildlife Service
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of Agriculture, Forest Service-Uinta National Forest
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- Utah Department of Natural Resources
- Utah Division of Wildlife Resources
- Utah Division of Water Resources
- Utah Division of Water Rights
- Wasatch County Special Service Area No. 1
- Utah Outdoor Interests Coordinating Council

4.2.2 Related Studies

Related studies required by law or executive order have been prepared and integrated with this EIS. The following sections briefly review these studies.

4.2.2.1 Fish and Wildlife Coordination Act

The Mitigation Commission consulted with the FWS on fish and wildlife resources and habitats that would be affected by the PRRP. Consultation meetings were held with FWS on September 20, 1994, October 6, 1994, and March 13, 1995 to discuss requirements for Biological Assessments and the schedule to complete the Fish and Wildlife Coordination Act Report. Additional consultation meetings were held in June, August, September, and October of 1997. The FWS has prepared a draft Planning Aid Memorandum on the Final EIS to comply with requirements of the Fish and Wildlife Coordination Act. This Planning Aid Memorandum will be finalized in consultation with Utah Division of Wildlife Resources following public release of this Final EIS.

4.2.2.2 Endangered Species Act of 1973

The Mitigation Commission consulted with the FWS on T&E species and received a list of species in the impact area of influence. The Mitigation

Commission prepared a draft Biological Assessment for the PRRP, which was submitted to the FWS for review and comment. The Commission has prepared a final Biological Assessment and submitted it to the FWS. The FWS responded with a letter that the PRRP may affect, but is not likely to adversely affect, bald eagle and Ute Ladies'-tresses (Appendix E).

The Mitigation Commission has also consulted with the FWS, UDWR and others regarding the spotted frog, a candidate species. To assist in the development of recommendations for improving the alternatives for spotted frog and for developing conservation measures, the Mitigation Commission invited FWS, UDWR, and several nationally-renown authorities to participate on the Spotted Frog Advisory Team. Their recommendations have all been incorporated into the Proposed Action, SOPs described in Section 1.9.6.1 of Chapter 1 or as mitigation measures (Section 3.19.3) (see Appendix H for Spotted Frog Advisory Team recommendations).

4.2.2.3 National Historic Preservation Act

The Mitigation Commission consulted with the State Historic Preservation Office (SHPO) on cultural resources that could be affected by the PRRP. A Programmatic Memorandum of Agreement (PMOA) has been developed, and signed, (see Appendix F) authorizing the plan for survey, collection and documentation of cultural resources that would be affected by construction of the PRRP. A Final Cultural Resources Technical Report (Mitigation Commission 1997h) was prepared as a support document to this EIS and is available from the Mitigation Commission upon request.

4.2.2.4 Clean Air Act

An air quality analysis has been conducted and integrated with this EIS (see Section 3.10 of this EIS).

4.2.2.5 Executive Order 11988, Floodplain Management

Protection of floodplains and their management has been included in the environmental analysis and integrated with this EIS (see Section 3.2 of this EIS).

4.2.2.6 Safe Drinking Water Act and Clean Water Act of 1977

A detailed water quality analysis has been conducted and integrated with this EIS (see Section 3.3 of this EIS).

4.2.2.7 Executive Order 11990, Protection of Wetlands

A detailed wetlands analysis has been conducted and integrated with this EIS (see Section 3.4 of this EIS).

4.3 Scoping Process and Results

The scoping process was conducted by CUWCD and the Mitigation Commission to provide the general public, organizations, state and local governments and affected federal agencies an opportunity to identify issues and concerns they believe should be studied early in the preparation of this EIS. "Scoping" is the public involvement process required by the Council on Environmental Quality (CEQ) regulations to help federal agencies determine issues and alternatives analyzed in the EIS. Results of the scoping meetings and comments received during the scoping process were used to establish the scope of the EIS and focus the environmental analysis on important issues and concerns. This section summarizes the pre-scoping and scoping process, describes the results of scoping meetings and how the comments from those meetings were used, and identifies the agencies and organizations consulted.

4.3.1 Pre-Scoping and Scoping Process

Pre-scoping public involvement activities were conducted by CUWCD starting in 1992 to obtain early input on the PRRP. They included developing and administering a public survey, forming technical and public advisory committees, and conducting a public involvement meeting and workshop at Wasatch High School in Heber City during June 1992. Input received from these activities was used to plan the project and contributed to development of a Conceptual Plan Report in June 1992.

The CUWCD held three initial scoping meetings in February 1993 to inform agency representatives, water users, irrigation companies, environmental organizations and the general public about the

progress of project planning and to obtain public input on preliminary alternatives and the scope of issues that should be addressed in the EIS. Results of these meetings were used to formulate project alternatives that were refined into a set of definitive alternatives by the technical and public advisory committees. The definitive alternatives were presented to the general public and agencies at two final scoping meetings held in March 1994.

4.3.2 Results of Scoping Meetings and Use of Comments Received

Public input at the scoping meetings and written comments received from interested citizens and organizations were carefully reviewed and analyzed to determine the issues and concerns. The analysis showed the public and agencies placed high priority on the following resources: socioeconomics, recreation, aquatic resources, wetlands, wildlife resources, agriculture, threatened and endangered species and surface water. Resources of moderate importance included water quality, transportation, soils and groundwater. Issues and concerns about these resources were used to establish the scope of the environmental analysis for the PRRP EIS.

The verbal comments made at the scoping meetings and written comments received by the CUWCD were used to identify specific issues and concerns that are addressed in the environmental analysis. These issues and concerns were restated as questions and used to identify impact topics and methodologies for analyzing impacts on the resources. The questions are listed in each resource section and answered by the impact analyses presented in Chapter 3.

4.3.3 Agencies and Organizations Consulted

The following agencies and organizations were consulted during the scoping process. Their level of participation in scoping ranged from attending agency and public meetings to responding with written comments to the CUWCD and the Mitigation Commission.

- U.S. Department of the Interior
- U.S. Fish and Wildlife Service (FWS)
- U.S. Department of Agriculture, Forest Service-Uinta National Forest (USFS)
- U.S. Department of Agriculture, Soil Conservation Service (SCS) (now called Natural Resources Conservation Service (NRCS)
- U.S. Environmental Protection Agency (EPA)
- U.S. Army Corps of Engineers (COE)
- U.S. Bureau of Reclamation (USBR)
- Utah Department of Natural Resources (UDNR)
- Utah Division of Wildlife Resources (UDWR)
- Utah Division of Water Resources
- Utah Division of Water Rights
- Utah Division of Parks and Recreation
- Utah Department of Environmental Quality (DEQ), Division of Water Quality
- Utah State Engineer
- Wasatch County Special Service Area (WCSSA)
- Wasatch Soil Conservation District (SCD)
- Wasatch County Commission
- Salt Lake County Water Conservancy District (SLCWCD)
- Utah Outdoor Interests Coordinating Council (UOICC)
- Trout Unlimited
- Salt Lake County Fish and Game Association
- Stonefly Society
- Sierra Club
- Utah Wildlife Board
- High Country Flyfishers
- Wasatch County Water Users
- Provo River Water Users Association (PRWUA)
- Utah Lake Water Users

Representatives of these agencies and organizations made verbal comments at one or more scoping meetings or submitted written comments to CUWCD and the Mitigation Commission after scoping meetings, which helped identify issues and concerns about resources. Their comments were used to establish the scope of the environmental analysis.

4.4 Coordination

This section describes the coordination that was achieved in reviewing the Draft EIS (DEIS). A complete mailing list of all agencies, bureaus, organizations, groups and individuals that received the DEIS is available upon request from:

Utah Reclamation Mitigation and Conservation Commission
102 West 500 South Suite 315
Salt Lake City, UT 84101

4.4.1 Request for Official Comments

The following agencies, bureaus, groups and organizations received a copy of the DEIS for review. Table 4-2 lists those who supplied comments on the DEIS.

- U.S. Department of the Interior
- U.S. Fish and Wildlife Service
- U.S. Department of Agriculture, Forest Service-Uinta National Forest
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Environmental Protection Agency
- U.S. Army Corps of Engineers
- U.S. Bureau of Reclamation
- Utah Department of Natural Resources
- Utah Division of Wildlife Resources
- Utah Division of Water Resources
- Utah Division of Water Rights
- Utah Division of Parks and Recreation
- Utah Department of Environmental Quality, Division of Water Quality
- Utah State Engineer
- Wasatch County Special Service Area
- Wasatch County
- Wasatch Soil Conservation District
- Wasatch County Commission
- Salt Lake County Water Conservancy District
- Utah Outdoor Interests Coordinating Council
- Trout Unlimited
- Salt Lake County Fish and Game Association
- Stonefly Society
- Sierra Club
- Utah Wildlife Board
- High Country Flyfishers
- Wasatch County Water Users
- Provo River Water Users Association
- Utah Lake Water Users
- Private individuals who had requested a copy

4.4.2 Public Hearings

Two public hearings were held on the DEIS — one in Heber City and the other in Salt Lake City. Following are the hearing dates, times and locations:

Heber City DEIS Hearing

Date:	**July 16, 1996**
Time:	**6:00 p.m.**
Location:	**Wasatch County Middle School 800 S. 200 E. Heber City, Utah**

Salt Lake City DEIS Hearing

Date:	**July 17, 1996**
Time:	**6:30 p.m.**
Location:	**Salt Lake County Commission Chambers 2001 S. State Street Salt Lake City, Utah**

4.5 Results of Public Review of the DEIS

4.5.1 Introduction

This section in the Final Environmental Impact Statement (Final EIS or FEIS) describes the results of the public review process. It should be noted that when the PRRP Draft EIS was released, the same document also contained the WCWEP and DRP Draft EIS. After completion of the public review process, the decision was made to release the Final EISs as separate documents.

This section is divided into three parts: Section 4.5.1 Introduction, Section 4.5.2 Comment Letters and Responses, and Section 4.5.3 Hearing Comments and Responses.

The Draft EIS (MC DES-96-01) was filed with the Environmental Protection Agency on June 10, 1996, and announced in the Federal Register on June 13, 1996 (Vol. 61, Number 115, page 30111). In addition, media releases were sent to 23 newspapers in Wasatch County, Salt Lake County, Utah County, and Uintah County, Utah. The releases announced the availability of the Draft EIS, briefly described the Proposed Action and requested public comments.

Approximately 500 copies of the Draft EIS were distributed by mail to various individuals, organizations, and government agencies (see Section 4.4.1). During the 60-day public comment period (June 10, 1996 to August 13, 1996) the Mitigation Commission and CUWCD conducted two formal public hearings to solicit public comments on the DEIS (see Table 4-1 for details). The public hearings covered both the PRRP as well as the WCWEP and DRP. The public hearing transcripts have not been reprinted because they are part of the public domain. However, copies of the hearing transcripts may be reviewed at the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission) office at 102 West 500 South, Suite 315, Salt Lake City.

In addition to the testimony received at the public hearings, the Mitigation Commission received a total of 26 letters addressing the PRRP Draft EIS during the comment period.

4.5.2 Comment Letters and Responses

This section contains the comment letters and responses. As stated in Section 4.5.1 the Mitigation Commission received 26 letters addressing the PRRP Draft EIS. Each letter was assigned a reference number (see Table 4-2) and reviewed. Responses were prepared for substantive comments (those that presented new data, raised new issues, or disagreed with the impact conclusions). When appropriate, Draft EIS sections were revised in the Final EIS. Those comments presenting exclusively opinions were also recognized. All comment letters have been reprinted verbatim in this section. Each comment in the letter was identified with a number. The response to each comment is numbered with the same number as the comment and printed on the opposite page from the comment letter. Two letters (number 18 from NRCS and number 21 from USGS) contained comments on the WCWEP/DRP Draft EIS. These comments are identified by shading and are not responded to in this Final EIS. They were responded to in the WCWEP/DRP Final EIS.

The comment responses either explain that the Draft EIS text was revised to incorporate the change recommended by the comment or explain why a text change was not appropriate. The responses to the comments that resulted in revising sections of the Draft EIS provide as much specific information as possible (Final EIS chapter and section number) for the reader on the location of the revised text.

Table 4-1
Draft EIS Public Hearings

Location	Date	No. of Attendees	No. of Speakers
Heber City	July 16, 1996	103	23[a]
Salt Lake City	July 17, 1996	33	8[b]

Notes:
a Only 22 speakers commented on the PRRP Draft EIS
b Only 7 speakers commented on the PRRP Draft EIS

Table 4-2
Comment Letters Received

Reference Number	Source of Letter
1	HUD Rocky Mtn. Region
2	U.S. Department of Commerce
3	State Representative Beverly Evans
4	Joleen Bell
5	Marilyn Dinger
6	Utah Council Trout Unlimited
7	Jerry Clegg
8	Bureau of Reclamation
9	Wasatch County Water Service Area
10	Wasatch County
11	David Frandsen
12	Provo River Water Users Association
13	State of Utah
14	Steve Williams
15	U.S. Department of Health & Human Services
16	Ann Zuspann
17	Anglers Inn
18	NRCS
19	U.S. Environmental Protection Agency
20	UOICC
21	U.S. Geological Survey
22	U.S. Fish & Wildlife Service
23	Salt Lake County Water Conservancy District
24	Dennis Webb
25	Peter Hovingh
26	Corps of Engineers

Note: The letters were numbered in the order received.

COMMENT LETTERS AND RESPONSES FOLLOW THIS PAGE

U.S. DEPARTMENT OF
HOUSING AND URBAN DEVELOPMENT
ROCKY MOUNTAIN, DENVER
FIRST INTERSTATE TOWER NORTH
633 17TH ST.
DENVER, COLORADO 80202-3607

June 20, 1996

Ms. Karen M. Ricks, Project Manager
Central Utah Water Conservancy District
355 West 1300 South
Orem, UT 84058-7303

Dear Ms. Ricks:

This is in response to your request for comments on the proposed Wasatch County Water Efficiency Project and Daniel Replacement Project (WCWEP and DRP) and the proposed Provo River Restoration Project (PRRP) Draft Environmental Impact Statement (DEIS).

1.1 The Department of Housing and Urban Development (HUD), has reviewed your DEIS with consideration of the areas of responsibility assigned to HUD. This review considered the impact of the project on housing and community development in the area. We find the DEIS adequate for our purposes due to the slight impact anticipated on housing and community development in the project area.

If I may be of further assistance, please contact me at (303) 672-5285 extension 1009.

Sincerely yours,

Howard S. Kutzer

Howard S. Kutzer
Regional Environmental Officer
Office of Operational Support

cc:
Mr. Michael C. Weland, Executive Director
Utah Reclamation, Mitigation and
Conservation Commission
355 West 1300 South
Orem, UT 84058-7303

Responses to Comment Letter No. 1

1.1 Thank you for your comment.

UNITED STATES DEPARTMENT OF COMMERCE
Office of the Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

July 16, 1996

Ms. Karen M. Ricks
Project Manager
Central Utah Water Conservatory District
355 West 1300 South
Orem, UT 84058-7303

Dear Ms. Ricks:

Enclosed are comments on the Draft Environmental Impact Statement for Wasatch County Water Efficiency Project/Daniel Replacement Project in Wasatch County, Utah. We hope our comments will assist you. Thank you for giving us an opportunity to review this document.

Sincerely,

Donna Wieting

Donna S. Wieting
Acting Director
Ecology and Conservation Office

Enclosure

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
National Geodetic Survey
Silver Spring, Maryland 20910-3282

JUL 11 199?

MEMORANDUM FOR: Donna Wieting
Acting Director, Ecology and Conservation Office

FROM: Captain Lewis A. Lapine, NOAA
Director, National Geodetic Survey

SUBJECT: DEIS-9606-06--Wasatch County Water Efficiency Project/Daniel Replacement Project in Wasatch County, Utah

The subject statement has been reviewed within the areas of the National Geodetic Survey's (NGS) responsibility and expertise and in terms of the impact of the proposed actions on NGS activities and projects.

All available geodetic control information about horizontal and vertical geodetic control monuments in the subject area is contained on the NGS home page at the following Internet World Wide Web address: http://www.ngs.noaa.gov. After entering the NGS home page, please access the topic "NGS Products and Services" and then access the menu item "NGS Products." This menu item will allow you to directly access geodetic control monument information from the NGS data base for the subject area project. This information should be reviewed for identifying the location and designation of any geodetic control monuments that may be affected by the proposed project.

2.1 If there are any planned activities which will disturb or destroy these monuments, NGS requires not less than 90 days' notification in advance of such activities in order to plan for their relocation. NGS recommends that funding for this project include the cost of any relocation(s) required.

For further information about these monuments, please contact John Spencer; SSMC3, NOAA, N/NGS; 1315 East West Highway; Silver Spring, Maryland 20910; telephone: 301-713-3169; fax: 301-713-4175.

Responses to Comment Letter No. 2

2.1 Thank you for your comment and information. The National Geodetic Survey will be notified at least 90 days before implementing the project if monuments may be affected by construction.

Comment Letter No. 3

HOUSE OF REPRESENTATIVES
STATE OF UTAH

REPRESENTATIVE BEVERLY A. EVANS
54TH DISTRICT
(DUCHESNE AND WASATCH COUNTIES)
HC65, BOX 36
ALTAMONT, UTAH 84001-9801
RES. 454-3719 / BUS. 722-4523
FAX 722-5801

STANDING COMMITTEES: RETIREMENT; EDUCATION, CHAIR; ENERGY, NATURAL RESOURCES AND AGRICULTURE
APPROPRIATIONS: GENERAL GOVERNMENT AND CAPITAL FACILITIES

July 24, 1996

Mr. Michael C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
Central Utah Water Conservancy District
355 West 1300 South
Orem, UT 84058

Re: Comments on Draft Environmental Impact Statement
Provo River Restoration Project

Dear Committee Members:

I appreciate the opportunity to respond to the environmental impact statements have been prepared for the Provo River Restoration Project. There are a number of concerns that need to be addressed concerning this project. The amount of federal and state impact on Wasatch County are extreme with the development of projects which include but are not limited to:

1. Strawberry Reservoir
2. Diversion water projects
3. Jordanelle Reservoir
4. DWR purchased tracks of land in Charleston, Daniels and other major holdings in Wasatch County
5. Deer Creek Reservoir
6. Wasatch State Park
7. Parks and Recreation land holdings in Wasatch County
8. Pubic ownership on federal and state lands in the county
9. Strawberry Drainage

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Since 1960 over 38,000 acres have been taken from private ownership by federal and state agencies for recreation, water, and multiple use. The economic impact on the county has been devastating as they continue to increase their tax burden on county residents in order to support services including: garbage collection, law enforcement, search and rescue and a strain on the infrastructure of the county at the same time their tax base has been eroded through federal and state ownership.

The continued economic drain on the taxpayers has become a real burden because of the increased recreational use of the county. The development of the waterway would only compound the issues the county is now facing.

The following issues need to be addressed in the impact statement:

3.1 1. The river flow cannot be controlled from flooding no matter what type of diversion is made because of the heavy spring runoff when there is a large water year. How will this be monitored?

3.2 2. The fisheries are a risk because of the fluctuation of the stream flow and certainly needs to be addressed.

3.3 3. The proposed project will increase wetlands and how is that to be adjusted for.

3.4 4. The mitigation does not need to be more than 50 feet and yet the proposal states a much larger corridor than what is needed. This issues is unclear and needs addressed.

3.5 5. The process is flawed and has not included input from the local residents and private land owners who are directly impacted. Their concerns have not been addressed throughout the document eventhough they have been presented in every scoping meeting that has been held. How will these issues be addressed?

3.6 6. What impact will the loss of water in the valley have on the economic viability of the residents in Wasatch County?

3.7 7. The ecological impact is addressed in a very general way. The economic, social and demographic issues need to be addressed.

Responses to Comment Letter No. 3

3.1 The PRRP will not cause any additional flooding of non-project lands, even during heavy spring runoff, because the Jordanelle Reservoir storage and releases have been designed to accommodate the high spring runoff events mentioned in the comment. Reservoir storage has been sized to fully contain the volume generated from greater than a 100-year runoff event. Discharges from Jordanelle Reservoir (outlet works and, in extremely rare events, spillway flows) into the PRRP Project Area will be monitored by the Bureau of Reclamation as part of the normal operation and management of the reservoir.

For more detailed information, please refer to the following: The Proposed Action and Existing Channel Modification Alternative provide a minimum of 100-year flood protection, as noted in the Draft EIS, Chapter 1, Section 1.3.2 paragraph 1, Section 1.3.6 paragraph 1, Section 1.7.2.3, and Section 1.8.2. Map A-9 in the Draft EIS shows 2-year, 10-year and 100-year flood boundaries for the Proposed Action. For the Instream Structures Alternative, No Action Alternative and Baseline Conditions, the existing channel system provides channel and flood plain capacity (flood easements) for a minimum of the 100-year flood flow. Project design hydrology and impacts of Jordanelle Reservoir storage on peak flood flows are discussed fully in the PRRP Draft Water Resources Technical Report, Section 3.4.

3.2 Changes in the flow regime that are proposed for the Provo River below Jordanelle dam are part of the baseline condition and will benefit most indigenous and sport fish species. Now that Jordanelle Dam is operational, stream flow fluctuation will be less than in the past (please refer to the PRRP Draft Aquatic Resources Technical Report (CUWCD 1996a) Section 3.2.3) and a base flow of 125 cfs will be released as part of the baseline conditions. Impacts of the baseline conditions and restoration alternatives on fish resources are evaluated in Chapter 3, sections 3.5.5 and 3.5.6 of the PRRP Draft EIS and the PRRP Draft Aquatic Resources Technical Report.

3.3 Two of the primary purposes of the Provo River Restoration Project are to (1) increase the biological productivity and diversity, and (2) rehabilitate and create a diversity of wetland and aquatic habitats. To achieve these purposes, it is necessary to increase wetlands. The creation of wetland habitats will not only increase biological diversity, but will provide essential habitat for species such as the spotted frog, who's populations have greatly declined in recent decades. Active wetland creation will only occur on existing or acquired project lands.

3.4 Your comment addresses the minimum width of 50 feet for a public access corridor for public angler access along the Provo River from Jordanelle Dam to Deer Creek Reservoir. The commitment for this corridor was made as part of the Record of Decision for the 1987 Final Supplement to the Final Environmental Impact Statement for the Municipal and Industrial System of the Bonneville Unit, rather than as a component of the PRRP. The 50 feet public access corridor is considered a baseline condition as described in the Draft EIS, Chapter 3, Section 3.1.2. Please also see Section 1.4.1, Chapter 1, of the Final EIS.

As is described in Section 1.2 of the Final EIS, the purposes and needs of the PRRP include the implementation of CUP and Provo River Project mitigation requirements over and above just the public angler access requirement of the 1987 M&I Final Supplement. These are fish habitat and riparian habitat improvements. There has never been a limitation of 50 feet from the channel edge associated with meeting those environmental mitigation commitments. Section 1.11.1 in Chapter 1 of the Draft EIS described land use and ownership changes associated with the PRRP alternatives. The Proposed Action requires a corridor of greater than 50 feet on each side of the proposed channel in some reaches to provide area for flood plain and riparian habitat development, to accommodate off-channel features (side channels, ponds), to avoid creating isolated "islands" of private ownership within the Core Area, and to set aside an appropriate Core Area for potential minor channel migration. The Existing Channel Modification Alternative could not be constructed completely within the baseline corridor either; it would require an additional 22 acres of fee title and/or easement acquisition to complete. The Instream Structures Alternative could be constructed completely within the baseline corridor. Please see Section 1.3, in Chapter 1 of the Final EIS for an overview of the Proposed Action and alternatives including land acquisition requirements.

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3.5 Public input from local residents and private landowners has greatly influenced the planning for the PRRP. PRRP planning has at times been integrated with planning for other projects in the Heber Valley area (Wasatch County Water Efficiency Project, Daniels Replacement Pipeline Project, Provo River Parkway proposal, etc.). Chapter 4, Section 4.3 of the Draft EIS discussed the consultation that took place prior to publishing the Draft EIS. Since the consultation on PRRP occurred in conjunction with the WCWEP and DRP EIS, the reader was referred to that portion of the EIS for details on the consultation that had occurred.

Please refer to Chapter 4, Section 4.2 and 4.3 in the PRRP Final EIS for a more detailed explanation of the consultation and coordination that occurred in developing the Proposed Action and alternatives, as well as in the preparation of the Final EIS. Much of the coordination which occurred in the development of the Proposed Action and alternatives is documented in numerous technical memorandums which are available for inspection at the Mitigation Commission office. Also please refer to the Summary, Section S.3 in the Final EIS that discusses changes made to the Proposed Action as a result of concerns raised during the public review of the Draft EIS.

3.6 Restoration of the Provo River channel would not change the supply of any water user because flows would not be changed by any of the alternatives. Please refer to the Draft EIS, Chapter 3, Sections 3.2.6.3.1 and 3.2.6.3.2.

3.7 These subjects were covered in the Draft EIS and these sections have been revised and updated in the Final EIS. Socioeconomic impacts (which include economic as well as social impacts) are covered in Chapter 3, Section 3.12.6. Subsections cover agricultural economic impacts, revenue impacts on other sectors besides agriculture, income impacts, employment impacts, impacts on public services and related fiscal impacts, growth inducing impacts, and social impacts. The impacts on these topics are discussed for the proposed action and each alternative.

3.8 8. The impact on Wasatch County needs to be addressed and include the following:

A. Who will be responsible for the management of the parkway and who will have to pay the costs? Will it be the state of Utah or the residents of Wasatch County?
B. Who is financially responsible for the Maintenance and Operation after the parkway is built? What appropriation and financial responsible has the United States and the Water Conservancy District made toward the operation of this parkway?
C. Who will be responsible for law enforcement and who will pay for the needed services?
D. Who pays for any litigation or financial impact on the private property owners to guarantee and protect their rights.

3.9 9. How will the protection of private property owners rights against trespassing, damage to personal property and protection from access on private lands be managed? Who will assume the financial responsibilities?

3.10 10. The impact on existing infrastructure such as sewer lines needs to be addressed.

3.11 11. What type of coordination has been done with existing planning in the county?

3.12 12. What type of coordination has been done with existing studies such as trail development, impact of growth and future planning for infrastructure needs in the county?

3.13 13. There is no reference to links with the residents of Wasatch County. What type of partnership links have been made with the residents of Wasatch County?

3.14 14. There is no statement on the economic impact to the county residents?

3.15 15. The economic impact on agriculture is not addressed and needs to be evaluated?

3.8 impacts on Wasatch County residents and government which you identify will be addressed through the development of an Operating Agreement for the Provo River Corridor, among the Utah Reclamation Mitigation and Conservation Commission, Wasatch County, and Utah Division of Wildlife Resources, and possibly others.

A new section (Section 1.4.2) has been added to Chapter 1 of the Final EIS to provide information on possible management responsibilities and sources of funding.

Responsibility for litigation costs incurred by private citizens would depend on the type of suit and its final disposition. If the government damages the property or rights of a private citizen or corporation, it will compensate the affected party or correct the problem.

3.9 The river corridor will be managed to reduce the likelihood of the types of impacts you identify, and also to provide for local resolution of conflicts to the extent possible. These objectives will be accomplished by providing the infrastructure to accommodate public use of the acquired river corridor to include fencing of public/private property boundaries, development of designated parking and sanitary facilities, signing and information kiosks describing the limits of the public access and appropriate messages regarding the necessity to respect private property and adjacent land uses and rights. In addition, the management agreement among Wasatch County , Utah Division of Wildlife Resources and the Mitigation Commission will establish a local contact with authority to receive and act on complaints regarding private landowner conflicts. Funding support for law enforcement and facility maintenance (e.g. trash removal, fence repair, etc.) will also be provided as described in comment response 3.8. As with any other public/private land interaction, individuals are liable for damages which they cause to private property. If repeated trespass violations or other problems occur, the management authorities for the river corridor will meet with landowners and other affected parties to develop solutions to problems.

3.10 The Provo River Restoration Project will not permanently impact any public utility. The designers considered the existing infrastructure, such as sewer lines, public roads and bridges, and avoided proposing changes to most of these structures. Any unavoidable temporary impact to pubic utilities or infrastructure would be repaired or replaced as part of the restoration project. Please refer to Table 1-2 (last row), Section 1.3.6 in Chapter 1 of the Final EIS. The impact on existing infrastructure is covered in the Final EIS, Chapter 3, Section 3.12.6.3.6.

Also please see response to comment 3.8.

3.11 Please see the response to comment 3.5.

3.12 Please refer to comment response 3.5. Also please refer to Chapter 1, Section 1.11.2 in the Final EIS. The Commission has coordinated with the State concerning the Provo River Parkway proposal. This proposal will not be implemented and this decision is supported by the State Division of Parks and Recreation. A Wasatch Back Trail has been proposed. However, this trail would utilize existing roads and highways through the PRRP Project Area.

3.13 Please see the response to comment 3.5.

3.14 Please refer to the response to comment 3.7.

3.15 Chapter 3 of the Final EIS discusses the agriculture economic impacts in section 3.12.6.3.2.1. These impacts are discussed in terms of income and employment as well as social impacts on farmers and their families. No attempt was made to identify impacts on specific individuals, although the SOPs described in Chapter 1, Section 1.9.6 of the Final EIS would reduce the magnitude of these impacts.

3.16 16. The process has not considered the concerns of the residents of Wasatch County and they need to be included in the assessment of the project? The concerns of the residents of Wasatch County have not been addressed.

3.17 17. The impact on the county, open spaces, agriculture and ecological impacts need to be addressed?

3.18 18. What is the role of the State of Utah in management, planning, maintenance and operation, and overall operation of the parkway? What coordination has been done with the State, Governor's Office, Office of Planning and Budgeting?

3.19 19. Who is financially responsible for the future costs of this project? Where is that addressed? The jurisdictional issues are not defined?

3.20 20. What type of relationship between the county, state government, state agencies, federal government and federal agencies is planned? This issue is not addressed anywhere in the impact statement.

3.21 21. The impacts on Wasatch County have not been addressed and need to be included in the study.

The EIS is very vague and does not address issues in detail. It is merely evasive, general and does not answer questions on management, financial responsibilities, and maintenance and operation responsibilities.

3.22 There needs to be a partnership developed between the Mitigation and Conservation Commission so that the issues can be resolved and issues addressed. Otherwise, it becomes a divisive project and polarizes the community, the recreation users, and the managers of the parkway. The partnership would allow for the stakeholders to meet and work out the differences so it becomes a win/win situation for everyone rather than a polarization effort which fragments everyone's efforts.

Wasatch County needs to be involved in the process because it directly impacts their lives, values, and legacy. The federal government should not come in and condemn property and disregard personal property owners' rights.

3.16 Please see the response to comment 3.5.

3.17 Chapter 3 of the Draft EIS addressed impacts on all of the resources you identified in your comment letter, at various places in the document: Chapter 3, Section 3.12 (Socioeconomics) regarding impacts to the county (on infrastructure and services, such as law enforcement); Chapter 3, Section 3.11 regarding Agricultural Resources; Chapter 3, Section 3.15 regarding Visual Resources (Open Space); and the remainder of Chapter 3 regarding ecological impacts. Also please see the response to comments 3.7, 3.8, and 3.9. The Final EIS also addresses these impacts. Section 3.12 in the Final EIS has been revised to incorporate an economic impact model developed by the State of Utah Office of Planning and Budget specifically for Wasatch and Summit Counties.

3.18 By implementing the PRRP, the Mitigation Commission is not establishing a parkway along the Provo River. Rather, the PRRP together with past environmental commitments of the Bonneville Unit to acquire and develop public access to the Provo River between Jordanelle Dam and Deer Creek Reservoir will be implemented. The PRRP will acquire and develop the river corridor to emphasize its natural resource values, their wise use and protection. The State of Utah, acting through the Utah Division of Wildlife Resources, will be a co-partner with Wasatch County and the Mitigation Commission in managing the river corridor. The Utah Division of Parks and Recreation supports the involvement of the DWR in the management of this area, as they are not interested in managing it on behalf of the State. The Utah Office of Planning and Budget has been invited to participate in meetings, and representatives have participated at various times, as well as provided demographic and socioeconomic data used in the Draft EIS and Final EIS analysis. In addition a new section (1.4.2) has been added to Chapter 1 of the Final EIS to provide information on management responsibilities and possible sources of funding.

3.19 Please refer to Section 1.4.2, of Chapter 1 in the Final EIS.

3.20 Additional text has been added in the Final EIS to address your concern. Please see Section 1.4.2 in Chapter 1 of the Final EIS.

3.21 Please refer to comment responses 3.7 and 3.15.

3.22 The Mitigation Commission continues to involve Wasatch County in its planning efforts regarding PRRP and related projects. Recent coordination has included development of draft management and operation and maintenance recommendations for the corridor. Please see Chapter 1, Section 1.4.2 of the Final EIS for more detail.

Summary:

3.23 By far the majority of the constituents I represent in Wasatch County are strong in opposition to the development of the Provo River Restoration Project. The alternative they strongly support is alternative 1.3.5, page 1-5 in the EIS Study which is the **No Action Alternative.** Also, the issues identified above need to be addressed and Wasatch County needs to be a partner in the process.

Sincerely,

Beverly Evans

Beverly Evans
District 54

3.23 Thank you for your comment. Please refer to comment response 3.22.

7/29/96

Micheal C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem, Utah 8405-7303

Thank you for letting me review an entire Draft Environmental Impact Statement. All of the attention to detail was very impressive. The charts, graphs, diagrams, cross-sections of the river bed, and especially the maps provided a broad, organized picture with incredible detail.

4.1 In reference to the Provo River Restoration Project, I strongly support the Proposed Action of Riverine Habitat Restoration. I strongly oppose the Existing Channel Modification Alternative and the Instream Structure Alternative.

Even though the Proposed Action would be costly and would be disruptive to the river ecosystem initially, it would mean so much to future generations to have this river restored. This is where I believe CUP funds should be directed.

Although a few people next to the Provo River corridor would suffer hardships, the people of the state of Utah would benefit. But in the future the people near the Provo River could be very proud of the pristine river habitat.

The way the construction is planned, done in sections, with the least possible impact, is very impressive. Because I am a teacher, I would even volunteer to manually remove noxious weeds during June, July and August.

Sincerely,
Joleen H. Bell
2379 East 900 South
Salt Lake City, Utah 84108

Responses to Comment Letter No. 4

4.1 Thank you for your input. Your concerns and input will be considered in the decision making process.

July 8, 1996

Michael C. Weland, Executive Director
Utah Reclamation Mitigation and
Conservation Commission
355 West 1300 South
Orem, UT 84058-7303

Dear Mr. Weland:

I would like to make my comments concerning the PRRP DEIS in the following manner:

5.1 (1) First of all, I support the changes in the Provo River that are proposed. I believe that in far too many cases, straightening rivers have done much more harm than good. If a river course naturally meandered, it should have been allowed to continue to do so. I believe that by the proposed changes the over-all present ecology will be vastly improved.

5.2 (2) I hope to see improvement in the scenic qualities of the area, as well. We need more scenic qualities and green spaces to improve our mental health, social climate, and spiritual outlook and perspective.

5.3 (3) The final alternative should make absolutely sure that no extinctions of native plant or animal wildlife occur, but that endangered species as well as stable species increase to healthy, viable numbers.

(4) In the final alternative I would like to see the condition of the following wildlife addressed: fox, bobcat, otter, beaver, and black bear. I also would like to see native bird life addressed, and where native birds and mammals once lived, where possible, I would hope that these might be restored to viable numbers.

(5) Were cottonwood riparian areas also once original habitat of the American black bear, and would the projects eventually provide for restoration of the black bear in such habitat <u>if</u> such was originally the case where peaceful coexistence is possible?

5.4 (6) We need more areas where there is no artificial light or noise pollution which is also healing to society and beneficial to good wildlife habitat.

These are just some of my concerns that I believe should be considered in the final alternative and would improve the proposed actions. I appreciate the opportunity to comment and look forward to hearing more about these projects in the future.

Sincerely,

Marilyn Dinger

Marilyn Dinger

164 North 650 East
Kaysville, UT 84037
(801) 544-9229

Responses to Comment Letter No. 5

5.1 Thank you for your comments and input. Your ideas and concerns will be considered during the decision making process.

5.2 Please refer to Chapter 3, Section 3.15 of the Draft EIS, regarding Visual Resources (Open Space). The implementation and management of the PRRP would preserve this stretch of river as a major open space corridor in Heber Valley.

5.3 As stated in Section 3.7 and Table 3-24 in Chapter 3 of the Draft EIS, and the Draft Threatened and Endangered Species Technical Report (CUWCD 1996b) the Provo River Restoration Project will not cause the extinction of any native plant or animal The Proposed Action may temporally impact Bald Eagles and Ute Ladies'-tresses (both Federally listed as Threatened Species), and Spotted Frogs (Federally listed as a Candidate Species), but over the long-term will benefit all Federally listed species by increasing habitat for these species. The Existing Channel Modification Alternative would result in a loss of habitat for Peregrine Falcons (Federally listed as Endangered) and Spotted Frogs, but would increase habitat for Bald Eagles and Ute Ladies'-tresses. The Instream Structure Alternative would not benefit or harm any Federally listed species.

The Draft EIS evaluated impacts for the Proposed Action and Alternatives during and after construction on both game and non-game wildlife species, including most of the animals mentioned in your comments (refer to the Final EIS, Chapter 3, Section 3.6 and the Final Wildlife Technical Report (Mitigation Commission 1997f). Black bear could range into the Provo River corridor, but their occurrence would be considered rare because of urbanization and human disturbance. As these impacts were covered in the Draft EIS, no changes to the EIS were considered necessary.

5.4 Please see comment response 5.1

Utah Council,Trout Unlimited
Paul F. Dremann
2348 Lynwood DR.
S.L.C., UT 84109
August 12, 1996

Michael C. Weland
Executive Director, URMCC
355 West 1300 South
Orem, UT. 84058-7303

Re: Draft Environmental Impact Statement
Provo River Restoration Project

Dear Mr. Weland:

Thank you for the opportunity to review and comment on the referenced Draft Environmental Impact Statement (DEIS).

The United States Senate Committee on Energy and Natural Resources Report on the Reclamation Projects Authorization and Adjustment Act of 1992 (Central Utah Project Completion Act) included some language that is extremely appropriate to the restoration of the Provo River below the Jordanelle Reservoir: (1)"The Commission should focus its programs on those ecosystems in the State that have substantial potential for producing fish, wildlife, and recreation benefits....." and (2)"The Committee recognizes that the development of the upper Provo River Parkway between Jordanelle Dam and Deer Creek Reservoir offers an opportunity rarely found in such close proximity to a major urban area." The House Committee on Interior and Insular Affairs expanded on this concept stating that preservation and restoration of this section of the Provo River "...will encourage a high-quality fishing experience" and "could result in creation of one of the finest "blue-ribbon" trout fishing streams in such close proximity to an urban population anywhere in the country." The House Committee went on to state that "it is the committee's intent that the Commission and all cooperating agencies coordinate their planning and development activities to achieve this goal."

We strongly concur with the intent of this Federal language. This stretch of the Provo River has the potential to become a significant First Class Tailwater Fishery, possibly surpassed only by the Green River below Flaming Gorge Reservoir.

6.1 We believe that the Proposed Action - Riverine Habitat Restoration will provide the best means of meeting the intent of the fisheries mitigation program as set out by the Act. In addition, we feel that restoration of these waters is one of the most important actions that will be taken by the Mitigation Commission.

The Utah Council, Trout Unlimited has reviewed the DEIS and submits the following specific comments:

Responses to Comment Letter No. 6

6.1 Thank you for your comment and input. They will be considered during the decision process.

6.2 1. There are numerous references to the need to 'modify' some existing diversion structures in order to pass the required 125 cfs minimum instream flow. In addition to the minimum instream flow, the diversion structures must incorporate a design that allows for effective fish passage. Throughout the preliminary design process, Trout Unlimited has repeatedly attempted to have fish passage incorporated into the restoration language, verbally and in writing. To date, all those efforts were unsuccessful. This capability cannot be assumed. It should be specifically stated in the Final Environmental Impact Statement (FEIS).

6.3 2. The DEIS stated that Jordanelle water releases would be managed for approximately 5 years following construction to prevent severe flooding and allow vegetation to become well-established along the channel banks. Although the possibility of flooding must always be considered, it is important to not lose sight of the intent of the mitigation, this is a river (fisheries) restoration project. What happens after the initial 5 year period? There must be a long term commitment to manage the Jordanelle water releases for the benefit of water users AND the fishery.

6.4 3. Section 3.3.6.1.2 states that the Proposed Action would result in an initial increase in water temperatures due to removal of riparian vegetation. This increase in temperature can be, at least partially, offset by the operation of the outlet works of the Jordanelle. This operational capability should be specified in the FEIS.

6.5 4. Section 3.5.5.1 describes the Provo Rivers' game fish and their habitat. There is no reference to a Fish Management Plan in this section or elsewhere in the DEIS. The ultimate success of this mitigation effort will, to a large extent, depend upon on an effective Fish Management Plan. Language to this effect should be included.

6.6 5. Table 3-14 appears to be misleading. It states that the least productive stream reaches are those immediately below Jordanelle (reaches 8 and 9). It is our understanding that this is not correct and the data in the Table should be reversed to reflect the high stream productivity in these reaches. If this is not correct, please add an explanation as to why the river becomes more productive the further away from the Jordanelle outlet works it gets.

6.7 6. The Net Increase in Angler Days for the Riverine Habitat Restoration (Table 3-34) appear to be quite low. Please expand on the basis for these numbers.

6.8 7. The Recreational Analysis Methodology Assumptions, outlined in Section B.2.15.1 appear flawed. They are based upon past, not projected/future angler use and contain a significant amount of undocumented statistics. This data gives a misleading perspective on the value of the restoration.

6.2 The Proposed Action and Existing Channel Modification Alternative would replace the concrete and log sills at all existing diversions with vortex rock weirs or similar features (see Chapter 1 of the Draft EIS, Sections 1.7.1.1 and 1.8.1.1). As described in the PRRP Technical Report (CUWCD 1994)(Sections 5.2.1, 5.3.1 and 6.3.2), these structures are designed to accommodate fish passage at high and low flows.

The Instream Structures Alternative and No Action Alternative would not include modifications to the diversion sills as part of the PRRP. Any modifications would be made under baseline conditions. As noted in several locations in the Draft EIS (e.g., Section 1.3 and Section 3.1.2), baseline conditions include modifications to the existing irrigation diversions to pass the 125 cfs minimum flow while still maintaining the ability to divert the specified water right. This is in compliance with the Final Supplement to the Final Environmental Statement for the Municipal and Industrial System (USBR 1987). The Final Supplement does not require modifications to the diversion sills to accommodate fish passage; however, this will be an objective of the Mitigation Commission, as it implements baseline conditions, as further described in Chapter 3 of the Mitigation Commission's 1997 Mitigation and Conservation Plan, and would be completed to the extent funding would allow.

Therefore, only the Proposed Action and Existing Channel Modification Alternative would address problems of fish passage at the existing diversion sills due to the change in river channel location and/or geometry associated with those alternatives.

6.3 The PRRP design hydrology, described in Section 3.4 of the PRRP Technical Report (CUWCD 1994), is based on USBR-predicted Jordanelle Reservoir releases and mimics the pattern of natural runoff in the Provo River basin. PRRP channel and floodplain features (width-depth ratios, frequency of overbank flows, velocities, etc.) have been designed to be consistent with the post-Jordanelle Reservoir hydrology. Therefore, the PRRP alternatives are designed to enhance fishery benefits based on the currently proposed schedule for Jordanelle Reservoir releases.

It may be possible to modify the proposed Jordanelle Reservoir release schedule to further increase fishery benefits without adversely impacting downstream water users. This would require further analysis and coordination with several agencies (e.g., Jordanelle Reservoir management is the responsibility of the Bureau of Reclamation, and CUWCD, not the Mitigation Commission). Minor reservoir release schedule modifications could be implemented without significantly affecting the characteristics of the Proposed Action or PRRP alternatives.

Fishery benefits (and related project impacts associated with a more enhanced fishery) associated with a modified flow release plan would be in addition to those described in the Draft EIS.

Also, please refer to comment response 3.1 for additional information on high flows.

6.4 our comment may be correct, that releases from Jordanelle Reservoir may be made to offset short term temperature increases of the PRRP. However, regulating the reservoir outflow to mitigate for these temperature increases, as suggested in your comment, will not be necessary because the projected maximum summer temperatures as stated in the Draft EIS (Chapter, sections 3.5.6.3.1.1 and 3.5.6.4.1.1) for all river reaches, are within the range of an optimal rating according to the methodology used for the Binns HQI Model II.

6.5 Thank you for you comment and input. The Division of Wildlife Resources has been extensively involved in the planning for the PRRP alternatives. Technical design criteria, as well as project purposes, have been developed with Division of Wildlife Resources input. However, fishery management regulations, such as harvest and gear restrictions, are within the purview of the State of Utah.

6.6 The baseline habitat quality attribute ratings and predicted trout standing crop for the Provo River were determined using the Binns Habitat Quality Index Model II. Table 3-14, in Chapter 3 of the Draft EIS reports habitat attribute ratings and trout standing crop for baseline conditions as predicted by the Binns method (refer to section 2.5.1 in the WCWEP and DRP and PRRP Draft Aquatic Resources Technical Report).

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The notion that the river reach below Jordanelle Reservoir will be more productive than other reaches probably comes from the fact that the first few miles below several large reservoirs are very productive trout fisheries, and these reaches are significantly more productive than other downstream river segments (e.g., The Green River below Flaming Gorge Dam and the Colorado River below Glen Canyon Dam). However, there are notable differences between many of these tail-water fisheries and the Provo River. For instance, many of these reservoirs release water of sufficient quality and temperature as to enable the existence of a productive trout fishery in river segments that ordinarily would not be conducive to trout fisheries, and these productive attributes deteriorate in the downstream direction. This is not the case with the Provo River. In the past, the Provo River was a very productive fishery and the productivity did not depend on unnatural conditions created by a reservoir. Therefore, it is reasonable to expect that Provo River fishery will be most productive where the habitat attributes are most favorable. This assumption appears to be valid below Deer Creek Reservoir. Therefore it was not considered necessary to make any changes to the material which was presented in the Draft EIS.

6.7 In response to this and other related comments, a different methodology was used to prepare the estimates of recreation use in the Project Area. This resulted in a significantly higher estimate of recreation use than what was presented in the Draft EIS. Please refer to Chapter 3, Section 3.16, and Appendix B, Section B 2.15 in the Final EIS.

The methodology used in the Final EIS was recommended by the Utah Division of Wildlife Resources and is included in the U.S. Bureau of Reclamation Report, Forecasting Changes in Site Specific Recreation Use (USBR 1996). It involves applying recreation use densities from similar and nearby recreation areas, in this case, the lower Provo River below Deer Creek Reservoir. Another method that focuses on the capacity of the parking areas in the Project Area also was used for comparative purposes and produced a very similar result.

6.8 A different methodology was used to prepare the recreation use estimates presented in Chapter 3, Section 3.16 of the Final EIS. This revised methodology addresses the concerns that you raised in your comment. Please see the response to comment 6.7 and the revised Section 3.16 and Section B. 2.15 of Appendix B in the Final EIS.

6.9 8. The 'braided' section of the river, Reach 4, is basically an undiked natural river. The DEIS shows significant restoration work required. This reach currently acts much like a 'natural' river and should receive only minimal restoration emphasis.

6.10 9. It is assumed that any conceptual design shortcomings will be eliminated during the actual implementation process. We do not consider these shortcomings to detract from the value of the Proposed Action.

6.11 10. There was no mention of the need to operate the Jordanelle Reservoir in such a way as to optimize the water quality to meet the needs of the fishery. Parameters such as water temperature, dissolved oxygen, turbidity, phosphorous, and rate of change of flow should be specified. It is our understanding that Reservoirs' outlet works can be managed to meet the needs of the fishery and still be within the States' Water Quality Standards. The outlet works can and must be operated to meet the needs of both the water users and fish and wildlife. Language to this effect should be incorporated into the FEIS.

6.12 The tremendous population growth along the Wasatch Front is putting a great deal of pressure upon many of the rural, recreational areas of the State. Wasatch County is an excellent example with Strawberry Reservoir, Current Creek Reservoir, Deer Creek Reservoir, Jordanelle Reservoir, and Wasatch State Park. The resulting impact on the Counties' infrastructure is significant. This impact must be addressed, perhaps with some relief granted at the state (government) level. In any event, these impacts should have minimal effect on the selection of the appropriate alternative/action selected for the river restoration. The problems exist without any river restoration project.

The Proposed Action would result in substantial benefit to the riparian habitat, positively impacting not only fish but avian and amphibian wildlife and stream bank stabilization. These benefits, perhaps overlooked in some past stream mitigation (that focused on fish habitat such as instream structures), are an important part of the Provo River Restoration Project.

Thank you for your consideration of this letter and for its inclusion in the review process.

Sincerely,

Paul F. Dremann

Paul F. Dremann
Vice President, Conservation
Utah Council, Trout Unlimited

6.9 Your opinion concerning Reach 4 is appreciated and will be considered in the final design phase. Based on other similar comments and on monitoring conducted during 1997, channel and riparian characteristics appear headed towards achieving the objectives of the Proposed Action. Therefore, the Proposed Action has been revised to include only minor reconstruction in Reach 4. Please refer to Chapter 1, Section 1.5.1 in the Final EIS for a description of the revised Proposed Action.

6.10 Thank you for you comment and input. The PRRP will undergo a final design for the selected alternative, and then will be implemented over a period of several years. The Commission will apply knowledge gained through the final design process, as well as learned through implementation, to its construction.

6.11 Baseline water quality conditions in the Provo river were determined to be at least adequate if not optimal for fishery production. The PRRP does not propose substantial changes to the proposed operation of Jordanelle Reservoir. Therefore, water quality conditions under the PRRP would remain adequate to optional.

Also please refer to comment response 6.4.

6.12 Please see comment response 3.8, 3.9, and 3.10.

Michael C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem, Utah 84058-7303

August 9, 1996

Dear Sir:

This letter is in response to the proposed Provo River Restoration Project, the description of
which I have read with great interest and whose success I hope to see. There is, however, one
aspect to the project that I find troubling: the proposal to condemn land for access roads and public
parking along the Provo in Heber Valley. This proposal is obviously, so it seems to me, not "on
mission." It has nothing to do with environmental mitigation of the effects of the Central Utah
7.1 Project, and in my opinion it should not be viewed as meeting any legal mandates you are obliged
to heed. It would also contribute to the cost of the project which seems to many to be excessive:
$10 million per mile as calculated on the basis of the proposed increased length of the river bed
between the two CUP reservoirs in Heber Valley. The savings from adhering to the mandated
environmental mission could surely be spent more wisely in other ways and other places.
Eliminating its public access feature would also lessen the hostility of local property owners and
7.2 their supporters to the project, and it would probably temper as well the opposition of Wasatch
County officials who do like to see the tax basis of the county diminished while its social service
obligations in the form of garbage collection and law enforcement increase.

In closing I would make a second suggestion: that you consider buying easements from
property owners to the extent required for your environmental (not recreational) goals, thereby
allowing farmers to continue their ranching activities which, though on a reduced scale, would
7.3 allow them to earn a living with the help of the investment income they could generate from the sale
of easement rights. If such an arrangement were to be made I think you see opposition to the
PRRP decline dramatically.

Sincerely,

Jerry S. Clegg

Jerry S. Clegg
P.O. Box 9910
Mills College
Oakland, California 94613

Responses to Comment Letter No. 7

7.1 You raised a concern regarding the use of condemnation of land for access roads and public parking. Please refer to section 1.11.1, the first paragraph in the left hand column on page P 1-51 of the Draft EIS. This lists several possible ways of acquiring the land necessary for constructing the project and required facilities. Condemnation of land would be the last method used and would be used only if the land that is required for the project could not be acquired in any other fashion.

However, the Federal government has already committed to acquiring and establishing the public access corridor and parking areas you refer to, regardless of whether the PRRP is implemented or not. Please refer to Sections 1.4.1 and 1.4.2 in Chapter 1 of the Final EIS for a more detailed explanation of these commitments.

7.2 The public access feature of the project is a key feature and meets the mitigation requirements and needs. Please refer to Section 1.2.1, last paragraph in the right hand column on page P 1-2 of the Draft EIS. The public access points and needs were identified, analyzed and approved in previous documents, and will be implemented as part of baseline conditions even if no further action was taken to improve the Provo River. Please refer to Section 1.4.1, left hand column on page P 1-5 of the Draft EIS, especially item (A) which includes providing recreation opportunities. Part of the impacts that the PRRP is mitigating is the loss of recreational opportunities, especially stream and river fishing, that occurred when other Central Utah Project facilities were built such as the Jordanelle Dam and reservoir. Please also see comment response 3.4.

7.3 Thank you for your suggestion. Please refer to comment response 7.1. All possible ways, that will achieve the goals of the project, to acquire the necessary land area will be examined.

United States Department of the Interior

BUREAU OF RECLAMATION
Upper Colorado Region
Provo Area Office
302 East 1860 South
Provo, Utah 84606-7317

IN REPLY REFER TO:
PRO-750
ENV-6.00

AUG 13 1996

Mr. Michael C. Weland
Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem UT 84058-7303

Subject: Bureau of Reclamation Comments on Draft Environmental Impact Statement for the Provo River Restoration Project

Dear Mike:

This office received and reviewed the subject document. This letter contains the comments of the Bureau of Reclamation on the subject document from both the Provo Area Office and Upper Colorado Regional Office. We appreciate the opportunity to review and comment on the document and offer the following comments for your consideration in preparation of the final document.

First, we will discuss general comments which apply to the document as a whole. They are followed by specific comments directed to specific references in the document.

GENERAL COMMENTS:

8.1 1. Document Structure - Reclamation believes the general outline of the document is too complicated. The chapter and sub-heading numbering system used in both the Table of Contents and in the body of the document are confusing and unnecessarily break the narrative into too many small pieces. Our reviewers of the document had a difficult time following both the structure and content of the document. Reclamation recommends that the document be simplified in both its outline and presentation by combining section S to eliminate duplication. Example: Table of Contents, Page Pv, Section S.3, Chapter 3 - Affected Environment and Environmental Consequences, S.3.1 Areas of Controversy or Concern and S.3.2 Major Impact Conclusions could be synthesized into one section titled Summary of Impacts, Concerns and Controversy. We believe similar simplifications could be made throughout the document. Further, the inclusion of two draft environmental impact statements in one volume added to both the complexity and magnitude of the document, making it difficult for us to clearly understand the proposed action and its impacts.

8.2 Cont. 2. Jordanelle Wetland Project - We are very concerned about potential impacts to Reclamation's Jordanelle Wetland Project that would result from the Proposed Action. This wetland has been constructed and developed as mitigation for the construction of Jordanelle Dam, a major facility of the Bonneville Unit of the Central Utah Project. The wetland is a requirement of the Corps of Engineers Section 404 permit for construction of Jordanelle Dam. Reclamation has made a significant investment of effort and cost to develop this wetland. We are concerned that both the short-term and long-term impacts of the Proposed Action may impair Reclamation's ability to meet the 404 permit and mitigation commitments. That could adversely affect operation of the Central Utah Project in the future. The proposed mitigation for impacts to the Jordanelle Wetland Project that are described in Chapter 3 of the document may not be adequate to satisfy the regulatory requirements of the Corps of Engineers and result in an

Responses to Comment Letter No. 8

8.1 We are aware that the detailed numbering system used to organize the document has the disadvantage of often disrupting the flow, and hence more comprehensive understanding, of the information. Its advantage is that it provides an excellent tracking mechanism to find information throughout the document. In order to ameliorate the disadvantage that you describe we are taking two actions. First, the PRRP will be issued as a separate document. All reference information for PRRP can now be found in the PRRP Final EIS which will eliminate the need to refer back to the Wasatch County Water Efficiency Project EIS for information about PRRP. Second, the Final EIS includes a summary that is written in a style which should aid readers in reaching a comprehensive understanding of the project.

8.2 As stated in the Draft EIS, Chapter 3, Section 3.4.6.3.6, the Proposed Action could impact up to 26.1 acres of the Bureau's constructed wetlands. Slight adjustments to the Proposed Action described in the Final EIS reduced this amount to 24.5 acres. Removing these diked wetlands is necessary to fit a meandering channel corridor of the appropriate meander dimensions. All of the project ecologists, including those with specialties in both plant and animal science, agree that the complex riparian forest created under the Proposed Action will interact more effectively with the riverine system, have greater ecological value, and better represent those wetlands impacted by the Central Utah Project than the existing diked wetlands. The Commission will assume the 404 wetland mitigation requirement for any wetland, constructed or natural, impacted by the implementation of any restoration alternative. The Commission will submit an application for an Individual 404 Permit with the US Army Corps of Engineers, and will satisfy all permit requirements.

8.2 Cont. unsatisfied mitigation and permit requirement. Resolution of this concern will require the cooperation of Reclamation, the Commission, and the Corps of Engineers.

3. Environmental Justice - The document does not address or discuss environmental justice. Reclamation believes there should be a discussion regarding environmental justice in this document. The requirement for such a section in the document is based on Executive Order 12898, dated February 11, 1994. A Departmental Memorandum issued on May 30, 1995, makes environmental justice a requirement in all Department of the Interior NEPA documents:

8.3

> "Therefore, henceforth all environmental documents should specifically analyze and evaluate the impacts of any proposed projects, actions, or decisions on minority and low-income populations and communities, as well as the equity of the distribution of the benefits and risks of those decisions.
>
> To comply with the environmental justice policy established by the Secretary, bureaus and offices should identify and evaluate, during the scoping and/or planning processes, any anticipated effects, direct or indirect, from the proposed project, action or decision on minority and low-income populations and communities, including the equity of distribution of the benefits and risks."

Please contact Jacqueline Murphy at 801-524-5580 for additional information and copies of the draft guidance regarding environmental justice.

4. Indian Trust Assets - The document contains no discussion of Indian trust assets. Reclamation believes that Secretarial Order No. 3175 regarding departmental responsibilities for Indian trust resources applies to this project. The order states that, "The heads of bureaus and offices are responsible for being aware of the impact of their plans, projects, programs or activities on Indian trust resources. Bureaus and offices, when engaged in the planning of any proposed project or action, will ensure that any anticipated effects on Indian trust resources are explicitly addressed in the planning, decision and operational documents; i.e. Environmental Assessments, Environmental Impact Statements, Management Plans, etc., that are prepared for the project."

8.4

Reclamation recommends that Indian Trust Assets be addressed in the document to be consistent with the Secretarial Order. The District should describe how and with whom the consultation regarding trust assets was conducted and the results of that consultation. Additional guidance regarding the federal, Departmental, Reclamation and Upper Colorado regional policies for Indian Trust Assets will be made available to you. Please contact Kib Jacobsen at 801-524-6861 for further information.

SPECIFIC COMMENTS:

8.5 Page PS-1

In Section S.1.1, the next to last sentence should be revised to provide a clearer statement about the prior commitments. For example, the sentence should read, "These commitments have not been implemented, **but will be implemented and are therefore** included in the baseline conditions of this EIS as further described in Chapter 3." This would be consistent with the description of the baseline later in the document (on Page 3-3).

8.6 Page P S-3

In Section S.1.3.4, we suggest that additional explanation about the angler access and minimum stream flows be included in the description of the No Action Alternative.

8.7 Cont. Page 1-2

Section 1.2.1, last paragraph, the narrative states that, "... maintenance of instream flows of 125 cubic feet per second (cfs). These commitments have not been implemented.". We suggest that this comment be revised to state that,

The Commission will continue to coordinate with the Bureau of Reclamation to achieve these changes if the Proposed Action is selected for implementation.

8.3 We appreciate your comment regarding Executive Order 12898. While the Commission is in full support of the intent of the Executive Order, we find that it has little application in the context of the PRRP. The objective of the Executive Order is to assure that each agency identify and address disproportionately high and adverse human health and environmental effects on minority and low-income populations. To address this requirement, the population affected must be identified as well as any possible hazard. In terms of direct effects, the area of impact is 12 miles long (from Jordanelle Dam to Deer Creek Dam).

Those individuals directly impacted are the landowners within the corridor. While Wasatch County's farm sector exhibited flat personal income growth during the 1980s and through 1995, and current projections indicate that the farm sector will remain flat throughout the impact period, the landowners within the corridor are not the "minority or low-income populations" targeted by the Executive Order. Even if the landowners could be considered as falling into this category the "disproportionately high and adverse human health impact" criteria would not apply. The Executive Order is concerned with multiple or cumulative exposure of human health to environmental hazards. The PRRP is projected to have an overall beneficial effect on the environment.

Lastly, the Executive Order is concerned that minority and low-income populations be given the opportunity to input into the process. Public meetings were held in Heber City, in the evening, so that any possibly affected populations would have a convenient opportunity to comment.

8.4 Based on a letter dated November 8, 1996 from the Bureau of Indian Affairs, there are no legal holdings in the project area that could be considered Indian trust assets.

8.5 Thank you for your editorial comment. The text of Section S.2.2 in the Final EIS has been revised to address this comment. Also please refer to Sections 1.4.1 and 1.4.2 in Chapter 1 of the Final EIS which have been added to explain baseline commitments and how they would be implemented in conjunction with the PRRP.

8.6 Thank you for your editorial comment. A statement has been added to Section S.2.2 of the Final EIS indicating that under the No Action Alternative, baseline conditions would still be implemented, including acquisition of public angler access, and minimum instream flows of 125 cfs would be provided downstream of Jordanelle Dam.

8.7 Thank you for your editorial comment. The text in the Final EIS has been revised to reflect your comment that the minimum flow of 125 cfs has been implemented since July 9, 1996 when Jordanelle Reservoir filled and was declared operational.

8.7 Cont.

"These commitments have not been fully implemented. Maintenance of the 125 cfs instream downstream from Jordanelle Dam to Deer Creek Reservoir was implemented on July 9, 1996." There are several other references to the 125 cfs instream flow in the document that should be similarly revised.

8.8

Page 1-30

Section 1.7.3.1 states that "Jordanelle Reservoir water releases would be managed for approximately 5 years following construction to prevent the occurrence of severe flood flows.". We suggest that the words "To the extent possible,..." be added to the beginning of this sentence.

8.9

Page 2-5

Section 2.3.3 states that 26.1 acres of the Reclamation wetlands would be impacted by the Proposed Action. We believe that the area of impact has been underestimated by about 5.0 acres. The discrepancy appears to be a large area on the west side of wetland cell N-16 that was not identified as an area of impact in the document. Based on the wetland impact area shown on map A-10, we believe that an additional area of the wetland would be adversely impacted and should be included in the total area of impact. Map A-10, reach 9, shows the river course being modified in the area between stations 4.000 and 4.750 to swerve between the constructed wetlands cells. This area is a jurisdictional wetland and is also part of the agreement which Reclamation has with the Corps of Engineers to enhance, in return for credit toward fulfilling our mitigation commitment. This area does not appear to be included in the total wetland losses associated with the project.

8.10

Page 3-12

In Section 3.3.6.3.2.2 Eutrophication, the document states that,

"The Proposed Action would cause minor increases of TP in the Provo River during and immediately after construction (as described in Section 3.3.6.3.1.1). This is not considered significant since it would not increase annual Reservoir TP concentrations."

This statement is not accurate because seasonal increases in TP will result in an annual increase in TP. In addition, all phosphorus inflows into Deer Creek Reservoir are not equal. Decreasing blue-green algae blooms in Deer Creek Reservoir has been a major emphasis of the TP wasteload allocation system established by the Jordanelle Technical Advisory Committee since 1984. The result has been a significant decline in noxious blue-green algal blooms in Deer Creek Reservoir. These blooms begin in July and August, and usually reach a peak by late September or early October. Population dynamics are such that phosphorus inputs in July and August may be very important in the ultimate peak concentrations reached by late September. Since the most construction-disturbing activities will likely occur from July through September, the impacts of increased phosphorus loading on increased blue-green algal blooms may not be insignificant. Construction-induced erosion and subsequent TP loading should be kept to a minimum by use of "Best Management Practices" in July-September. Since the river will ultimately be routed into newly created stream sections, and since significant erosion will occur during this period of time; we suggest that this work be done primarily from late November through April. Thus the increased loading of TP would have minimal impacts on the blue-green algal population dynamics in Deer Creek Reservoir. Construction schedules may not always allow this scenario, but it is important that the construction work be scheduled, and the erosion control plan be designed to minimize the increased TP loading as much as possible. We believe that characterizing this loading as "insignificant" may lead to a general lack of awareness and a potential future problem. A great deal of effort and expense has gone into the Provo River phosphorus waste load allocation system. All impacts to that system are significant.

8.8 Please see change in Chapter 1, Section 1.5.4.1. in the Final EIS.

8.9 Thank you for your comment. The wetland impact analysis has been revised for the Final EIS and now includes 2.8 acres of permanent adverse impact for the wetland area addressed by your comment (see Map A-5 in pocket at the back of he Final EIS).

8.10 Thank you for your comment. The text of Section 3.3.6.3.2.2. has been revised in the Final EIS to indicate that the impact of minor increases in sediment and associated nutrient inputs to Deer Creek Reservoir during the July through September period could exacerbate existing blue-green algae blooms, but the impact would be reduced by the revision of an SOP (see Section 1.9.6.1 in Chapter 1 of the Final EIS) to avoid in-channel construction work during the July through September period to the extent possible.

Pages 3-12 and 3-13

8.11 Section 3.3.6.3.1.2 Temperature - The entire temperature discussion throughout this document is difficult to follow and understand. There is no connection between upstream and downstream reaches of temperature predictions made in Table 3-4. Therefore, it is impossible to determine what the accumulative impacts are across the entire section. It should be noted that the Jordanelle Dam Selective Level Outlet Works have been in operation during the summer of 1996, and that the interagency task force has been collecting temperature data throughout this stream reach in 1996. We suggest that a summary of this data be added to the document. In addition, the accumulative impact of temperature changes predicted needs to be displayed showing how the temperatures would change from those measured in 1996. Also, some projections should be made as to the length of time required to re-establish stream bank vegetation (density and height), and the incremental changes in temperatures with time (years). The travel time from Jordanelle to Deer Creek will not exceed 12 hours even after the stream length has been increased. Since temperature will not increase significantly across this reach at night, trout will have windows of suitable temperature to feed and recover from warmer conditions each day. Therefore, the maximum and minimum temperature changes, and the hours of temperature above about 68 °F versus the hours of temperatures in more optimum feeding ranges of 50 to 64 °F would be a much more useful analysis than the one based solely on daily average temperatures presented in Table 3-4.

8.12 The discussion also suggests that new cottonwood growth would require 15-30 years to re-establish needed stream side shading. The channel presently has a lot of willow tree growth along the existing dikes. Many of these willows are already 20 to 30 feet in height. Such willow may be cut and simply stuck in the water table along the new stream channel, and will re-establish substantial growth in only a few years. Using these various willow species to revegetate the new stream banks would provide substantial shading and erosion control within a few years, and should be one of the "best management practices" utilized in this project. Cottonwood trees should also be planted to help re-establish the needed shading as quickly as possible.

Page 3-18

8.13 In Section 3.4.6.3.1, the description of impacts to Reclamation's replacement wetlands is not accurate. Classification of the area as a wet meadow is not totally accurate, since there is a significant amount of emergent marsh that will be impacted.

Page 3-49

8.14 In Section 3.6.6.3.1.2, the impacts to riparian areas on Reclamation's property in Reaches 8 and 9 will be significant. This area has been included in the Utah Division of Wildlife Resources annual avian survey for the past four years and is considered to be the best location in the state for species diversity and richness. The loss of this riparian habitat would displace neotropical migrants, which return to the same locations to nest each year. These migrants would have to find other suitable habitat within the area. Since there is a shortage of this type of habitat it can be assumed the Proposed Action would ultimately result in a decline of the neotropical migrant population.

Page 3-102

8.15 Cont. In Section 3.19.2.3, the proposed wetland mitigation for the Proposed Action does not provide enough detail for us to assess the adequacy of the mitigation. We believe the mitigation for loss of wetland functions and values associated

8.11 Thank you for your comment. The level of analysis presented in the DEIS was sufficient to determine potential impacts on aquatic life. Please refer to comment response 6.4. Revisions to the Draft EIS were not felt to be necessary.

8.12 The Draft EIS estimated that it would take between 15 to 30 years for the re-established forest to *mature*, but this does not mean that all shade would be eliminated. The undisturbed and re-established riparian forest would shade the river, albeit to a lesser extent than a mature cottonwood forest. Some of this reduction will be compensated for because the newly constructed channel will be narrower than the existing channelized river and hence, the undisturbed or immature trees will be more effective in casting a shadow over the water.

The revegetation effort will be carefully planned and will certainly use cuttings from existing plant materials such as your letter suggests. Many of these cuttings, including cottonwood trees, will be collected and rooted prior to planting.

8.13 Thank you for your comment. Chapter 3, Section 3.4.6.3.1 and 3.4.6.3.2 in the Final EIS has been revised to reflect your concern. The Mitigation Commission determined impacts to wetlands for the feasibility-level design. As segments of the final design are completed, exact wetland impacts will be delineated.

8.14 The comment that "the proposed action would ultimately result in a decline of the neotropical migrant population" is incorrect. The Commission has accomplished additional field work in this area and made appropriate revisions in the Final EIS and the Wildlife Technical Report. Please refer to Chapter 4, Section 4.3.2.1.2 in the Final Wildlife Technical Report and Chapter 3, Section 3.6.6.3.2.2 of the Final EIS. Restoration construction activities would disturb reaches 8 and 9 for one or two seasons, but most of these impacts are limited to the construction period. Removal of trees during construction would temporarily reduce the forested area in reach 8 and 9, but the total area of riparian forest should greatly increase in the long-term.

8.15 The Commission and their consultants are working closely with the Corps of Engineers to identify jurisdictional wetlands that may be impacted by the restoration project. The Corps has federal authorization to enforce section 404 of the Clean Water Act, which requires avoidance, minimization, and mitigation of impacts to wetlands. The Corps will make the final determination regarding the extent of impacted wetland area and the adequacy of the proposed mitigation. The Commission will coordinate with the Bureau of Reclamation in this matter.

8.15 Cont.

with the Jordanelle Wetland Project is inadequate. The Corps of Engineers would need to concur with the proposed mitigation and an agreement prepared which would transfer all responsibility of any unfulfilled wetland mitigation after 1998 to the Commission.

8.16

Maps A-5 and A-7

Both the legend for the "Proposed Side Channel" and the map showing the proposed side channels are very misleading. Most of the "Proposed Side Channel" is existing irrigation ditches. The ditches should be labeled with their current names, and distinguished from proposed side channels by a different line, both on the maps and in the legend. These ditches irrigate pasture land and crops and are not proposed side channels.

Thank you for the opportunity to review and comment on the document. You may direct questions regarding these comments to Dan Fritz at 801-379-1150 at the Provo Area Office.

Sincerely,

David G Frandsen

ACTING FOR

Bruce C. Barrett
Area Manager

8.16 To clarify, not all existing irrigation ditches in the Provo River corridor are depicted on Maps A-5 and A-7. These maps show only those irrigation ditches which would be acquired as part of the PRRP and developed as side channels (see Chapter 1 of the Draft EIS, Section 1.7.2.2, paragraph 3). It was considered too confusing to denote on the maps which side channels were developed from existing irrigation ditches, which were developed from abandoned channel segments and swales, and which were newly constructed.

The side channels shown on Maps A-1 and A-3 of the Final EIS are also typical depictions. Final locations and dimensions would be determined based on local landscape features and lands acquired.

WASATCH COUNTY WATER SERVICE AREA
55 West Center Street
Heber City, Utah 84032
(801) 654-2909

COMMENTS ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR PROVO RIVER PROJECT

****

Submitted August 13, 1996 to:

Michael C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem, Utah 84058-7303

I. GENERAL COMMENTS:

9.1 A. Condemnation: Wasatch County officials and residents have long been troubled by the heavy-handed approach used by the Federal Government in Wasatch County. If the Mitigation Commission would remove condemnation as an option, and only acquire fee, easements or rights-of-way from willing sellers along the river, then a majority of the opposition from both the officials and the residents would disappear. People would like to feel that they have a choice in their future. No one likes to feel powerless. Consider negotiation and compromise and remove condemnation as an option.

9.2 B. Preservation of Agricultural Uses Along River Corridor: Agricultural land in Wasatch County is extremely valuable, not simply in terms of market value per acre, but in terms of custom, culture, economy and character of the valley. The Commission should make a commitment to agricultural practices along the river corridor, and do everything possible to facilitate that continued use. Clearly not all uses are compatible in every area. But much more analysis should be done to see if there are ways to make both the river and agriculture work well in the area. We would like to see an entirely new 10 to 15 page section added, complete with charts, maps and graphs, showing how agriculture could not only be tolerated in areas adjacent to the river, but how it could be promoted, enhanced and maintained in those areas. Occasional references in the documents indicate that this could be done. It just needs to become a specific area of focus and effort.

9.3 Cont. C. Mitigation of Impacts Caused by Recreationists: The analysis regarding the

Responses to Comment Letter No. 9

9.1 Thank you for your comment. The Mitigation Commission and the Department of the Interior are aware of the concerns about condemnation. Every reasonable attempt will be made to acquire the land and/or easements needed to complete the selected alternative on a willing seller basis. Condemnation would be used only as a last resort.

In response to this concern, the Mitigation Commission has revised the Proposed Action, which is the alternative that requires the greatest amount of land to implement, by defining two distinct acquisition areas. The Core Area includes the land base that must be acquired in order to implement and manage the Proposed Action. The Core Area does not contain sufficient property to construct all of the floodplain features (side channels, wetlands and ponds) described in the Draft EIS. The Core Area is described in new text added to the Final EIS (Chapter 1, Section 1.3.2). All land acquisition procedures would be used to acquire the Core Area, including condemnation, but only if efforts to acquire property on a willing-seller basis were unsuccessful.

The second area of acquisition has been defined as the Expanded Restoration Area. This area is land that would provide additional opportunities for habitat development and protection. These areas lie adjacent to the Core Area along some reaches of the Project Area. The Expanded Restoration Area includes property which would add to the ecological value of the Proposed Action by providing additional space for more side channels, wetlands, ponds or additional floodplain. The Mitigation Commission would acquire property within the Expanded Restoration Area only on a willing-seller basis. This approach also addresses the concern raised by some landowners that acquisition of riverine corridor habitats could result in uneconomical remainder properties. The Commission would acquire remainder parcels within this area from willing sellers.

9.2 The Proposed Action and Existing Channel Modification Alternative would each have unavoidable adverse impacts on some individual farming operations. The Mitigation Commission will continue to work cooperatively with landowners and farmers to the extent possible to mitigate those impacts through the land acquisition and negotiation process and by making accommodations to allow for continued agricultural practices adjacent to the Project Area where possible.

9.3 Thank you for your comment and concern. The recreation section (Section 3.16) and the economic section (Section 3.12) in Chapter 3 of the Final EIS have been revised. The model developed by the Utah State Office of Planning and Budget for Wasatch/Summit Counties was used in revising the economic analysis.

Also a new section (1.4.2) has been added to Chapter 1 of the Final EIS to provide information on possible management responsibilities and sources of funding.

9.3 Cont. impacts caused by recreationalists is woefully inadequate. According to the Wasatch County Sheriff, the average population in the County goes from approximately 12,000 on weekdays, to somewhere near 120,000 on summer weekends and holidays. Wasatch County gets no money to help pay the cost so someone else can play in Wasatch County. There are reservoirs, national forests, state parks, and now a proposal for a 600% increase in angler-days along the Provo River. No provision has been made for police protection, garbage pick-up, human waste clean-up, traffic, etc. There simply is not any substantive analysis of these issues. The Mitigation Commission will eventually be disbanded, and the legislative appropriations will dry up. Then Wasatch County is left tending the playground, without any help from those who built it. Funds should be placed in a capitalized account now, to pay for these impacts. A detailed study and resulting plan should focus on these issues. Wasatch County's concerns must be addressed before any additional work is done on the river corridor.

9.4 D. Management Plan: Similar to C above, there is precious little information in the EIS about how the management of the river will occur. Simply stating that the Mitigation Commission will enter into a management contract with some entity is not sufficient. There should be an entire section of the EIS dealing with long-term management of the project.

9.5 F. Federal or State Ownership of Private Lands in Wasatch County: As has been expressed by some of the Commissioners on several occasions, nearly 70% of Wasatch County is in public ownership. While that might be a great benefit to non-residents, it is an extremely sore issue for the County officials and local residents. Acquisition of additional lands seems to be the proposed solution to every problem. Wasatch County opposes the continued encroachment of federal and state agencies in to the small amount of useable private property in Wasatch County, and strongly encourages alternative solutions.

G. Assumption that Mitigation Obligations Must Be Met Along Provo River: This document, along with many other documents and discussions, always seems to imply that all the mitigation requirements for the CUP and other federal projects in Utah must be mitigated on the Provo River. Of course, this is not true. The Provo River is one of many locations where much, if not all, of this mitigation work could take place. The document should more clearly specify exactly what is legally required, and what additional mitigation obligations could be fulfilled. Wasatch County should not be the location where all CUP mitigation obligations are met.

9.6

II. SPECIFIC COMMENTS:

Page and Paragraph #	Comment
P 1-1 (1.2.1)	It should be acknowledged in here somewhere that most of the mitigation listed as a need is not legally required to be done on the Provo River. It would be helpful to identify clearly what exactly is legally required, and what additional mitigation is being considered.

9.4 Please refer to the last paragraph of comment response 9.3.

9.5 Thank you for your comment and input. They will be considered during the decision process.

9.6 Thank you for your comment. Please refer to the Final EIS, Chapter 1, Section 1.1.1.1. This section describes the background and legal history of the specific mitigation requirements addressed by the PRRP and points out that extensive mitigation for the impacts of the Bonneville Unit of CUP on fish and wildlife habitats has occurred at locations other than the Provo River, including elsewhere in Wasatch County, Utah County, Duchesne County, Davis County and Salt Lake County. This document addresses only those mitigation requirements of the Bonneville Unit of CUP and of the Provo River Project which could effectively be met on the Provo River between Jordanelle Dam and Deer Creek Reservoir. Other mitigation activities outside the PRRP project area will continue to be implemented in the future.

9.7	P 1-2 (1.2.1)	Last paragraph. "Measures to improve fish and riparian habitat and natural functions of the Provo River ecosystem are required . . . " They are not legally required except for possibly the requirements in the 1979 EIS - which is baseline in this document.
9.8	P 1-2 (1.3)	Wasatch County generally objects to fencing of the entire river corridor. Is this absolutely required, or can there be provisions made for existing and future agricultural uses?
9.9	P 1-5 (1.4.1)	Need to make clear that not all of this mitigation has to take place here along the Provo River between Jordanelle and Deer Creek.
9.10	P 1-23 (1.7.1.2)	Second paragraph on this page. If modifications to the channel alignment can be made to compensate for "manmade and natural constraints that force the channel into a straight alignment for distances of about 1000 feet," why can't similar modifications be made in sections where you don't have a willing seller. This would be much preferable to condemnation, and apparently, wouldn't seriously damage the functionability of the river any more than the modifications contemplated in this section. Couldn't this be done in other areas where the property owner doesn't want to sell?
9.11	P 1-25 (1.7.2.2)	Wasatch County objects to the project taking water as well as land, unless purchased from willing sellers.
9.12	P 1-26 (1.7.2.3)	Second paragraph. Won't these setback dikes adversely affect irrigation practices if they are location in active agricultural and grazing parcels?
9.13	P 1-30 (1.7.2.6)	First paragraph on this page. Couldn't rights of way, fee title, easements and access areas be negotiated with specific landowners.
9.14	P 1-21 (1.7.4)	Discussion of maintenance procedures is woefully inadequate. The Mitigation Commission will not last forever. Additionally, there is no guarantee that they will continue to receive funding. What if Mitigation Commission is disbanded, or funding runs out? Are funds going to be capitalized at the beginning to insure adequate maintenance? There should be much more analysis of this issue, inasmuch as Wasatch County will be left holding the bag if something goes wrong.

9.7 Thank you for your comment. The U.S. Congress adopted the 1988 Definite Plan Report for the Bonneville Unit of the CUP, including the commitment to fulfill outstanding mitigation requirements of the Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System (SACS), and the Municipal and Industrial System by the passage of Public Law 102-575 Titles II through VI, commonly known as the Central Utah Project Completion Act (CUPCA). The 1988 Aquatic Mitigation Plan for SACS specifically identified the Provo River for fish habitat improvements as partial mitigation of impacts of the SACS project. The 1987 Wildlife Mitigation Plan for the Bonneville Unit requires the mitigation of 228 acres of riparian habitats impacted by the Municipal and Industrial System. CUPCA also specifically authorized fish habitat improvements, riparian habitat development and recreation improvements along the Provo River in the PRRP Project Area (Sections 307(1), 309(a)(1), and 311(d)(2)). The impacts of the Provo River Project constructed in the 1940s and 1950s on fish and wildlife habitats were never systematically evaluated and so mitigation was not specifically assigned at that time

The mitigation measures for the Provo River contained in the 1988 Definite Plan Report, arising from the 1988 Aquatic Mitigation Plan for SACS and the 1987 Wildlife Mitigation Plan for the Bonneville Unit, are requirements of the federal government to be implemented by the Mitigation Commission. The Mitigation Commission proposes to fulfill those requirements by implementing the PRRP Proposed Cation. The Proposed Action and to a lesser degree the Existing Channel Modification Alternative also provide mitigation credits for the Provo River Project. The Expanded Restoration Area of the Proposed Action provides additional environmental mitigation and conservation benefits.

9.8 The fencing has been requested by private property owners along the proposed project. They felt that a fence would help secure their property from trespass. Also, the 1979 Final Environmental Statement for the Municipal and Industrial System (USBR 1979, page A-20) listed fencing of the access corridor as part of the baseline commitment:

> "To maximize fishing and other recreational opportunities below Jordanelle Reservoir, public access would be provided by the acquisition of 7 miles of 50-foot wide access lanes each side of centerline of the river or a minimum of about 25 feet of bank on each side. These acquisitions, along with 3 miles of river already in public ownership immediately upstream from Deer Creek Reservoir, would make the entire river between the two reservoirs open to the public. Seven vehicle pull-offs would be built at 1- to 2-mile intervals along the river, as shown in Figure A-5. Accommodating up to 700 people at one time, they would include car parking areas, restrooms, and launching ramps for kayaks, canoes, and rafts. The boundary of the access lanes would be fenced, unless suitable fencing already existed, and turnstiles would be provided at the entries to the vehicle pull-offs in order to close the facilities nightly and for management purposes as required by the State."

The Final Supplement to the Final Environmental Statement for the Municipal and Industrial System (USBR 1987) modified the public access corridor by limiting the corridor to foot access only, and eliminating the provisions for recreational boating access and facilities (USBR 1987, page 33). The requirement for fencing of the public access corridor remains unchanged.

Without a fence it would be impossible to control livestock from damaging newly established vegetation (Please refer to Chapter 1, Section 1.7.2.6 and Chapter 3, Section 3.11.5 in the Draft EIS). However, restoration planners will work with agricultural operations along the river to plan for livestock watering.

9.9 Thank you for your comment. Please see the response to comment 9.6.

9.10 Please refer to comment response 9.1. A Core Area needed for project implementation has been identified which would be acquired..

9.11 Water appurtenant to the property acquired for PRRP purposes will be acquired by the Mitigation Commission. Water is needed to fulfill project needs and purposes, such as evaporative losses which may occur from wetlands, side channels or ponds, as well as for instream flows for constructed side channel features. The Mitigation Commission and the Department of the Interior will utilize every reasonable approach to acquire properties, including water, on a willing-seller basis whenever possible.

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9.12 All the setback dikes would be placed on land either acquired for the Core Area or the Expanded Restoration area. (Please see comment response 9.1). Therefore, there would be no impact on irrigation practices. Modifications to irrigation systems to allow continued agricultural uses outside of the acquired Core Area or Expanded Restoration Area would be completed.

9.13 Chapter 1, Section 1.11.1, paragraph 5, of the Draft EIS indicates that approaches to acquisition of land required for the project would be worked out with individual landowners. This philosophy would also apply to negotiation of specific project boundaries on or near individual parcels.

9.14 Ongoing maintenance of the PRRP is critical to its long-term success. However, it is noted that the characteristics of the Proposed Action's restored channel have been specifically designed to minimize maintenance requirements. When the channel is restored to geomorphically stable conditions, the significant maintenance activities associated with the present channel would no longer be necessary. Establishment of a PRRP Core Area would provide room for the channel to make minor adjustments in alignment and grade in response to changing hydrologic or sediment supply conditions, just as a natural channel would, alleviating the need for "maintenance" to hold fixed alignments or elevations.

The need for management and maintenance of the PRRP corridor is also vital to the project's success. A new section (1.4.2) has been added to Chapter 1 of the Final EIS to provide information on possible management responsibilities and sources of funding. Any requirements beyond those shown in the new section under baseline are discussed under the Proposed Action and each alternative.

9.15	P 1-31 (1.7.4)	What "appropriate entity" will provide management, maintenance and security" and how will this management agreement be funded?
9.16	P 1-48 (1.11.1)	How much is it going to cost to acquire land for baseline condition? How much for additional land for proposed action?
9.17	P 1-51 (1.11.1)	Fourth bullet. Remove eminent domain as a viable option and a large majority of the opposition in Wasatch County would disappear.
9.18	P 1-51 (1.11.1)	We object to the continued use of the phrase that " All public angler . . . areas would be fenced to exclude livestock . . . " or its equivalent. You should develop and emphasize the last sentence of this paragraph more. "Provisions would be made for allowing livestock crossing or access zones through the fenced areas where this would be required by the landowner to continue grazing activities." This is the kind of effort that will sooth some of the landowner concerns.
9.19	P 3-5 (3.2.2)	Last paragraph on this page. "Payment to construct livestock watering facilities outside the acquired corridor would be included in the rights-of-way acquisition process where warranted." There should be an entire section about what will be done to mitigate the adverse impacts to landowners and how the project will preserve and even enhance agricultural uses. If as much thought were given to solving these problems as is given to enhancing aquatic resources, we would have a plan that all could be happy with.
9.20	P 3-11 (3.3.6.2)	Last paragraph. This impact should absolutely not be eliminated from further analysis. A 600%+ increase in recreational use of the river corridor will not occur without human waste becoming a problem. For an example, look at the situation on the Provo between Deer Creek Dam and Provo. You simply cannot walk into the underbrush anywhere without encountering someone's bathroom. This is more of an issue than the short paragraph would indicate, and ought to be fully studied and mitigated.
9.21 Cont.	P 3-76 (3.12.5)	Last paragraph. The discussion of impacts related to tourism should be more fully developed. Often, those things that are considered benefits by the agencies doing the study are perceived and felt as adverse impacts by the local residents and property owners. The chance to increase angler-days 600% might seem like a great benefit to some, but to locals it means a 600% increase in

9.15 The Mitigation Commission is discussing long-term management agreements with Wasatch County government and Utah Division of Wildlife Resources. Please see comment response 9.14.

9.16 It is estimated that 180.7 acres of property would be acquired under baseline conditions (see Chapter 3, Table 3-1, footnote #1 in the Final EIS). The cost of baseline property acquisition is estimated to be approximately $2,241,000. Costs for the Proposed Action have been revised, please see Chapter 1, TableÊ-17 in the Final EIS. Actual costs will be determined by market appraisals at the time of acquisition. An additional acquisition of 489.7 acres would be required for the Proposed Action.

9.17 Thank you for your comment. Please see the response to comment 9.1.

9.18 Please see comment response 9.8.

9.19 Thank you for your comment. Much effort, thought, and resources will be devoted to reducing impacts to agricultural practices. These issues will be addressed on a case-by-case basis as the project progresses. Also please see Section S3.6 of the Summary in the Final EIS.

9.20 Eliminating the impact from further analysis was based on the following: Seven fisherman access points are planned for the Provo River Project Area under baseline conditions. At each of these sites, restroom facilities will be provided for fisherman and recreationists. Therefore, additional analysis was not felt to be necessary.

9.21 Please refer to comment response 9.3

9.21 Cont. garbage, human waste, police problems, trespassing, and traffic. The analysis simply isn't there on these impacts.

9.22 P 3-77 (3.12.6.3.2.2)

This analysis does not accurately reflect the value to the community, as agricultural dollars circulate through banks, machinery vendors, gas-stations, etc. Much work needs to be done on the impact to the economics of the valley.

9.23 P 3-82 (3.12.6.3.8)

This analysis is inadequate. It doesn't address garbage, only briefly refers to crime, doesn't refer at all to medical services, etc. Much more analysis needs to be done.

9.22 The socioeconomic analysis in the Draft EIS has been revised. A new model developed by the Utah Office of Planning and Budget for Wasatch and Summit Counties was used. This model considered the direct and indirect effects of the project on the local economy. Please refer to Chapter 3, Section 3.12.6.3.2 in the Final EIS.

9.23 Please refer to comment response 9.3

WASATCH COUNTY
STATE OF UTAH

25 North Main • Heber City, Utah 84032 • Phone (801) 654 -3211

BOARD OF COUNTY COMMISSIONERS

KEITH D. JACOBSON T. LAREN PROVOST SHARRON J. WINTERTON

August 13, 1996

Karen M. Ricks, Project Manager
Central Utah Water Conservancy District
355 West 1300 South
Orem, Utah 84058

Dear Ms. Ricks:

Enclosed are the issues I feel need to be addressed for the Provo River Restoration Project.

If you have any comment or would like to discuss the project further, please call me.

Sincerely yours,

Robert A. Mathis
wa

Robert A. Mathis, AICP
Wasatch County Planner

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Enclosure
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Issues for the Provo River Restoration Project

1. The plan is incomplete.

   a. The plan does not address how people who use the fishery are to be managed. This is because the whole people management plan is to be seen as the baseline condition under the 1979 final EIS and 1987 final supplement to the EIS. (Page P S-1) However these statements represent vague references to parking lots and bathroom facilities. The final statement on this admits that there is no acceptable management agency and this must be worked out. (See 1987 EIS page 35.)

      i. These people are to be considered as part of the baseline condition. However the plan estimates that angler days along that section of the river would increase from negligible now to 9,240 days per year with the proposed action with a less than 1% change in County gross revenue receipts from all sources. (This does not mean taxes and fees. This means gross taxable sales and agricultural income. See page P 2-3. See also P 3-109, Sections 3.21.2.11 Socioeconomic.)

10.1

      ii. Who is to manage the people that use this section of the river? How are the parking lots and bathrooms and garbage to be serviced? Who is to take care of the trail which must be designed? The Parkway Law puts a major responsibility for this funding on Wasatch County. (See 1987 EIS page 35 and 63-11-16.5 through 17.7.)

   b. The plan does not tell how the project is to be maintained. It tells about building the project. (I think this is a cumulative impact and should have been addressed here. The way it is, the project can be built and the administration of the project will be shoehorned in to fit the project.)

   c. The plan does not explain how irrigators can get their water through the proposed dikes and expanded levies.

   d. The County must protect restored areas with zoning changes. (Page 1-14.)

   e. In short the County loses about $58,000 in property taxes, supposedly offset by in-lieu payments, for a gain of $120,000 in gross sales at unspecified locations. This is a net loss since the County's share of these revenues would equal less than $1,000 with an unspecified local cost to help maintain a parkway. (See page P 3-109, sections 3.21.2.11 Socioeconomic.)

10.2
Cont.

2. The plan has not involved adjacent landowners.

   a. The area is in transition. How are pasture interests and recreationists to interface?

Responses to Comment Letter No. 10

10.1 Thank you for your comment. Your comment dealt with the fact that the plan presented in the Draft EIS was incomplete. You identified several items where you thought that the plan was incomplete as well as citing data from the Draft EIS to support your concern. The following is provided in response to your concerns:

The Final EIS has been revised to contain additional information on how the project would be managed and funded. A new section (Section 1.4.2) has been added to Chapter 1 to provide information on possible management responsibilities and sources of funding. This section also identifies the efforts being undertaken to develop an operating agreement with Wasatch County.

You expressed a concern about how irrigators would get their water through the proposed dikes and expanded levies. Please refer to Chapter 1, Section 1.5.1.1 of the Final EIS.

Another concern was that the county would have to protect the restored areas with zoning changes. All of the Core Area required for the Proposed Action would be acquired in fee title (see Chapter 1, Section 1.3.2 of the Final EIS) so additional county zoning would not be required.

Also please refer to comment response 9.22 and the revised Socioeconomic section in the Final EIS.

10.2 Please refer to comment response 3.5 concerning your concerns about planning for the project.

There are several ways to facilitate the needs of livestock, including water gaps along the river, access to side channels or ponds, and watering troughs away from the river. If watering sites are built away from the river then a adequate supply of water will have to be developed. The Commission will work with each impacted land owner to ensure that their legal livestock watering rights are adequately maintained.

Flows will vary in the new Provo River channel from a minimum of 125 cfs to infrequent flood flows that could exceed 4,000 cfs (depending on the reservoir head). Even greater flows are remotely possible if Jordanelle Dam fills above the spillway. The range of flows that are regularly expected range from 125 cfs to 2,350 cfs.

10.2 Cont.

b. How are cattle to be watered on the new stream? (See page p 3-74 Section 3.11.6.3.3.) They won't. They will be given new watering facilities off stream. Can it work?

c. How much water is to go through the new channels? (I didn't get this straight yet.)

10.3

3. It has been years since the landowners and the water users in the Provo River system worked out a management and land use plan with a river that floods and seeps in a natural way. Now the land owners and the river users have worked out a system using the dikes and irrigation diversions now in place. Much needs to be done to adjust now and the work is not complete.

10.4

4. You know much is made about the low value of agricultural income based on current prices. However, if the farmers have no incentive to hold the land, what will become of it then? My guess is houses. Do they think they can maintain a healthy river in that kind of a situation?

10.3 The Mitigation Commission is aware of the coordination work that is required to make the Proposed Action or any of the alternatives work. However it should be recognized that none of the PRRP alternatives will increase the frequency or duration of flooding outside of the Project Area. Under each alternative, flood flows will be retained either within the existing channel or within the reconstructed Project Area including the designated 100-year floodplain area. The Existing Channel Modification Alternative and the Proposed Action will each utilize setback dikes in some locations to afford the 100-year floodplain protection to adjacent property, where topographic features of the river floodplain are not adequate to do so.

10.4 Please see Chapter 1, Section 1.11.2.1 in the Final EIS. This section discusses future urban development in Heber Valley. The analysis presented in the Draft EIS states that the PRRP would not cause urban growth. Baseline conditions, and continuing trends will cause continued growth in the Heber Valley. The PRRP has the potential of becoming a major, extremely valuable open space area within Heber Valley. Maintaining a healthy river in the face of urban development will depend on enforcement of current water quality regulations.

David G. Frandsen, P.E.
983 East 315 South
Orem, Utah 84058

Mr. Michael C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem, UT 84058-7303

Dear ~~Mr. Weland~~ Mike:

11.1 I am writing this as a private citizen who will live near the proposed river corridor. Map A-7, which shows the property acquisition under the proposed action shows the West Ditch ("proposed side channel") being acquired plus a section of land on the east side of the ditch. Panel B of the map, reach 7, opposite approximate stations 6500' to 6000', is land which I own, and the proposed acquisition goes approximately through the new house I am constructing, and encompasses the cabin that I own. Naturally I am very opposed to such an acquisition. Having been in attendance at some of the original planning meetings, I remember clearly that one of the guidelines was that no habitation would be taken.

11.2 This brings me to another large concern. The lands proposed for acquisition are much wider than that needed for the proposed restoration. The corridor often extends 800 feet or more on a side, taking in the existing irrigation ditches, which are shown on the legend as "Proposed Side Channel" as well as a large amount of farmland. I believe this is the cause of much unnecessary landowner opposition. With the high cost of these lands, the Commission may only have enough money to acquire the land,. and nothing left for the restoration, or at least insufficient funds to complete the restoration. I hope you will consider this carefully, and limit the acquisition to that actually necessary to provide a sinuous corridor. The side channels should be shown as existing irrigation ditches when this is the case, with the name of the ditch on the map. If the land is all acquired as shown, Potters Lane (3000 North) dead ends at the proposed corridor, and this lane would also become a parking lot/access area, which I am opposed to. It is not covered as an access point in the EIS.

11.3 My recommendation is that the Commission maximize the sinuosity within the lands already owned by the United States, and acquire only the bare minimum beyond that. Because of costs and opposition, it may be best to only restore the sinuosity on the upper 3 - 4 miles of U.S. lands, These lands are not all contiguous, and a few small sections would need to be acquired from willing sellers, but the amount of intervening private land is minimal. The remainder of the river could be upgraded with alternate 1 or 2.

Sincerely,

David G Frandsen

David G. Frandsen

Responses to Comment Letter No. 11

11.1 Thank you for your comment regarding the location of your property relative to the Proposed Action. Based on our understanding of the location of your parcel, we believe that the proposed acquisition boundary does not encroach on your property.

As the comment indicates, one of the design criteria was to keep the new channel at least 200 feet from existing structures and avoid acquisition of ownership or easements on parcels with existing residences wherever possible. Acquisition limits were established in 1995; construction of buildings after that date has not been considered in the conceptual design presented in the Draft EIS, but will be incorporated into the final design. If the proposed property acquisition boundary includes a house currently under construction, the acquisition boundary will be modified in final design or during property acquisition negotiations.

11.2 Please see the response to comment 3.4 concerning rationale for acquiring a land incorporating areas beyond the proposed channel alignment.

Please see the response to comment 8.16 concerning your comment on existing irrigation ditches.

Regarding Potters Lane and access points, only those seven access points designed in the Final M&I EIS would be developed as formal angler access to the PRRP Project Area (See Map 1-1 in Chapter 1 of the Draft EIS).

11.3 Thank you for your input. It will be considered during the decision process.

PROVO RIVER WATER USERS ASSOCIATION
DEER CREEK PROJECT
1788 North State Street
Orem, Utah 84057

Tel (801) 222-0710
Fax (801) 222-0724

August 13, 1996

VIA FAX AND REGULAR MAIL

Michael C. Weland, Executive Director
Utah Reclamation Mitigation and
Conservation Commission
355 West 1300 South
Orem, Utah 84058-7303

Re: Draft Environmental Impact Statements
Provo River Restoration Project - June 1996

Dear Mr. Weland:

The Provo River Water Users Association ("PRWUA") respectfully submits the following comments to the Draft Environmental Impact Statement ("DEIS") covering the Provo River Restoration Project ("PRRP") dated June 1996.

PRWUA is a Utah nonprofit corporation organized in 1935 for the purpose of providing a supplemental water supply to its shareholders comprising six metropolitan water districts, one conservation district, seven mutual irrigation companies and two small farming companies. To that end, PRWUA contracted with the United States Bureau of Reclamation ("Reclamation") for the construction of the Deer Creek Division of the Provo River Project (the "Project") and for the repayment by PRWUA of the Project construction costs. The Project includes, among other things, the Deer Creek Dam and Reservoir, the enlarged Provo Reservoir Canal, the enlarged Weber-Provo Diversion Canal, the Duchesne Tunnel and the Provo River Channel Revision. The care, operation and maintenance of the Project facilities have been transferred to PRWUA by Reclamation in accordance with the respective repayment contracts. More specifically, by letter dated January 8, 1954, Reclamation notified PRWUA that commencing March 1, 1954, PRWUA shall, at its own cost and expense, operate and maintain the Provo River Channel Revision and appurtenant and incidental works in a manner satisfactory to the United States. PRWUA is entitled to use the storage capacity of Deer Creek Reservoir, together with the total yield of storage water therefrom and a permanent right to the exclusive use of the water made available by the Project under the water rights therefor standing in the name of Reclamation.

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Michael C. Weland, Executive Director
August 13, 1996
Page 2

Rights to the use of the waters of the Provo River were adjudicated by the Decree of the District Court of Utah County dated May 2, 1921, made and entered in that certain action entitled Provo Reservoir Company v. Provo City, et al., being Civil No. 2888 ("Provo River Decree"). Subsequent to the entry of the Provo River Decree numerous water rights were established under Utah law through the issuance of Certificates of Appropriation by the Utah State Engineer, including the Project water rights issued in the name of Reclamation which include, among others:

> Water Right Nos. 55-7060 (a1902) and 55-7061 (a1903) covering the right to store 3,400 acre-feet ("AF") at a rate of 9.33 cubic feet per second ("cfs") annually of Provo River water in Deer Creek Reservoir during the irrigation season.
>
> Water Right No. 55-295 (A16642) covering the right to store 100,000 AF annually of Provo River water in Deer Creek Reservoir during the entire year.
>
> Water Right No. 55-262 (A12144) covering the right to store 17,410 AF of Provo River water in Deer Creek Reservoir annually by exchange during the following year for return flows of Project foreign water stored in Utah Lake.
>
> Water Right No. 35-8737 (A9569) covering the right to divert 136,500 AF of water at a rate of 1,000 cfs annually from the Weber River for storage in Deer Creek Reservoir during the entire year.
>
> Water Right No. 35-8756 (A12141) covering the right to divert 37,200 AF of Weber River water annually at a rate of 1,000 cfs for storage in Utah Lake and storage of like quantities of Provo River water in Deer Creek Reservoir by exchange during the following year.
>
> Water Right Nos. 43-341 (A12230) and 43-343 (A12229) covering the collective diversions of 55,000 AF of Duchesne River waters at a combined rate of 600 cfs for storage in Deer Creek Reservoir during the entire year.

In addition to the above, the water rights for the Bonneville Unit of the Central Utah Project ("BU") for the storage of Provo River water are evidenced primarily by approved Water Right Nos. 55-4494 (A40523) and E398 (55 AREA) standing in the name of Reclamation and covering the storage of 300,000 AF annually of Provo River water in Jordanelle Reservoir and Deer Creek Reservoir during the entire year. The apportionment and distribution of the waters of the Provo River between the Project and BU are governed by the Deer Creek Reservoir/Jordanelle Reservoir Operating Agreement dated November 1, 1994 (the "Operating Agreement"), among the United

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States of America, PRWUA and the Central Utah Water Conservancy District ("CUWCD").

The Operating Agreement requires CUWCD to provide from BU water the Provo River minimum stream flows required by the Central Utah Project Completion Act - Public Law 102-575 ("CUPCA") and no Provo River Project water will be required to satisfy any of those minimum stream flows (par. 21, p. 34, 35). The Operating Agreement further acknowledges that Reclamation has consulted with the U.S. Fish and Wildlife Service ("FWS") under Section 7 of the Endangered Species Act ("ESA") and FWS has rendered a Final Biological Opinion dated September 22, 1994, which includes a Reasonable and Prudent Alternative ("RPA") which Reclamation has agreed to implement in a manner consistent with the intended purposes of the Operating Agreement and consistent with Reclamation's legal authority and jurisdiction. Reclamation is responsible to ensure that funding proposals for implementing the RPA are presented to the Utah Reclamation Mitigation and Conservation Commission (the "Commission") and to the extent that such funding is not so available, Reclamation is responsible therefor. (par. 34(c), p. 48). Insofar as such implementation does not interfere with or impair the contractual rights of PRWUA under its repayment contracts, PRWUA will not interfere with reasonable measures taken by federal and/or state entities to implement the necessary steps as reasonable and prudent alternatives in the biological opinions of the FWS after consultation. (par. 34, p. 50)

One feature of the Provo River Project was a comprehensive Provo River Channel Revision conducted by Reclamation. One of the purposes of that Channel Revision was to increase the carrying capacity of the Provo River to 4,300 cubic feet per second ("cfs") from the Weber-Provo Diversion Canal to Deer Creek Reservoir.

As a part of the Provo River Channel Revision Program, Reclamation and PRWUA acquired fee title and/or easements along the entire length of the Provo River from what is now Jordanelle Dam to Deer Creek Reservoir. In some segments of that reach of the Provo River, dikes were constructed along the river channel and in some segments substantial offset dikes were constructed with imported rock and materials, to confine the waters of the Provo River within the flooding easements. In addition, extensive blanket flooding easements were acquired, including Tract Nos. 17 and 17D of the Parley Probst holdings, Tract No. 18A of the Douglas Edwards holdings, Tract No. 18C of the Thomas I. Baum holdings, Tract No. 36 of the John H. Buehler holdings, and Tract No. 38 of the Burton VanWagner holdings. The entire cost of the Provo River Channel Revision was included in the repayment obligation of PRWUA to Reclamation.

12.1 Cont.

The purpose of the above is to ensure that the Commission fully understands the nature, extent and complexity of the existing Project water rights, operating plans and agreements which might be impacted by the PRRP. PRWUA trusts that the Commission will give serious

Responses to Comment Letter No. 12

12.1 The Mitigation Commission and the U.S. Department of the Interior recognize the complexity of Provo River Project water rights and operating agreements. The Mitigation Commission and the U.S. Department of the Interior will coordinate with Provo River Water Users Association to address concerns related to implementing the PRRP Proposed Action or one of its alternatives. This has been added to Chapter 1, Section 1.5.5 of the Final EIS.

Michael C. Weland, Executive Director
August 13, 1996
Page 4

12.1 Cont. consideration to the above to avoid adverse impacts to the Project operations and water rights which might result from the implementation of the PRRP.

COMMENTS

Pursuant to Reclamation's January 8, 1954 letter, PRWUA, at its own expense, has operated and maintained the Provo River Channel Revision, including that segment of the Provo River from what is now Jordanelle dam to Deer Creek Reservoir. Under the Proposed Action ("Riverine Habitat Restoration") realignment of the Provo River would lengthen the channel from 10.3 miles to about 12.3 miles and would increase the flow time of travel from Jordanelle Reservoir to Deer Creek Reservoir from 3.9 hours to 4.9 hours at a flow rate of 500 cfs (P 3-6). Eight small ponds 10-15 feet deep with a total area of 5.6 acres would be created with side channels (P 3-12).

Section 1.3.2 (P 1-3) provides in substance that under the Proposed Action, existing levees would be removed and 100-year flood protection would be provided by the expanded flood plain or new setback levees and that side channels and ponds would be constructed on either side of the new river alignment throughout the length of the Provo River corridor between Jordanelle Dam and Deer Creek Reservoir. Water would be diverted from the Provo River into the side channels, flow into the ponds, continue flowing from the ponds down the side channels and return back to the river. Table 1-1 (P 1-7) provides in substance that the Proposed Action would remove or breach nearly all dikes; establish 400 + ft wide flood plain; increase existing river length by 10,540 feet; remove 47,800 feet of existing levee; and construct 16,100 ft of 2 ft to 3 ft high setback dikes to control flooding.

The DEIS erroneously assumes that PRWUA would operate and maintain the PRRP facilities. Thus, under Section 1.7.4 (P 1-31) the Proposed Action provides that:

> Maintenance of irrigation diversions and retain dikes would continue to be the responsibility of the irrigation companies or private irrigators. It would be necessary to examine and potentially modify the current maintenance and repayment contracts between Provo River Water Users Association and the United States to assure that they would be applicable to the new river channel.

12.2 Cont.

No one from CUWCD or the Commission has discussed the above with PRWUA. The bottom line is that PRWUA <u>will</u> <u>not</u> assume the obligation to operate and maintain the PRRP facilities and PRWUA <u>will</u> <u>not</u> accept any amendment to Reclamation's January 8, 1954 letter to so provide. In fact, PRWUA would strongly oppose both the Proposed Action, the Existing

12.2 The section on Maintenance Procedures and Management of the Project Area, Section 1.5.5 of the Final EIS, has been changed to clarify that management of PRRP facilities will not be by Provo River Water Users Association, and that coordination would occur with Provo River Water Users Association if any responsibilities which they currently have would be affected by the Proposed Action.

A new section (Section 1.4.2) has been added to the Final EIS which describes the management and operation and maintenance requirements of the baseline and PRRP project facilities. Management and operations and maintenance will be arranged through agreements to be finalized among the Mitigation Commission, Wasatch County, Utah Division of Wildlife Resources, and possibly other entities.

Michael C. Weland, Executive Director
August 13, 1996
Page 5

12.2 Cont. Channel Modification alternative and the Instream Structures alternative unless and until the Commission and/or CUWCD assumes in writing the full responsibility therefor and agrees in writing to indemnify and hold PRWUA harmless from any claims or damages which might result from the PRRP and the implementation thereof.

The DEIS assumes that all lands along and adjacent to the Provo River held in Federal ownership can be utilized in the PRRP without compensation to PRWUA. Section 1.11.1 (P 1-51) provides in part that all of reaches 8 and 9 are in federal ownership; therefore, no property or easement acquisition is required in the upper 2.5 miles of the PRRP. As noted above under the Provo River Channel Revision program, Reclamation and PRWUA acquired fee title or easements along the entire length of the Provo River from what is now Jordanelle Dam to Deer Creek Reservoir. The entire cost of the Provo River Channel Revision, including the land and easement acquisitions, was included in the repayment obligation of PRWUA.

Subsection J of the Fact Finders Act of December 5, 1924 (43 Stat. 703; 43 U.S.C. § 526), provides in part:

> All monies or profits as determined by the Secretary heretofore or hereafter derived from . . . the connection of a new project with an existing project shall be credited to the project or division of the project to which the construction cost has been charged.

12.3 To the extent that the Proposed Action will utilize the lands and easements acquired for the Provo River Project, the cost of which is included in the PRWUA repayment contracts, the Commission and/or CUWCD must compensate PRWUA for its costs incurred in those acquisitions under the foregoing Subsection J. Likewise, to the extent that the Proposed Action will utilize the imported rock and materials used in the construction of the existing dikes and levees, the Commission and/or CUWCD must compensate PRWUA for its costs incurred therefor under the foregoing Subsection J. Those costs should be readily available in the records of Reclamation.

CONCLUSION

12.4 Cont. The DEIS for the PRRP does not adequately address the interface between the Provo River Channel Revision Program and PRRP. The DEIS erroneously assumes that PRWUA will operate and maintain the PRRP facilities under a modification of the current maintenance and repayment contracts between PRWUA and Reclamation to assure that they would be applicable to the new river channel. PRWUA <u>will not</u> assume the obligation to operate and maintain the PRRP facilities under any circumstances and PRWUA <u>will not</u> accept any amendment to Reclamation's January 8, 1954 letter to so provide. In fact, PRWUA would strongly oppose both the Proposed Action, the Existing Channel Modification alternative and the Instream Structures alternative unless and

12.3 The channelization of the Provo River through building of dikes for the creation of the Provo River Project has resulted in the loss of fish and wildlife habitat with an accompanying loss of fisherman access as well as other effects. In fact, a major reason that mitigation credit is available for the measures proposed in the PRRP is because of the environmental effects of the Provo River Project. Thus, the decision to rectify the environmental effects of the Provo River Project is fully within the authority of the federal government. This federal authority to redress Provo River Project impacts is only enhanced by the fact that the United States owns property interests associated with the Provo River Project which can be used to adjust Provo River Project operations to correct environmental problems and effects. Further, the right of the United States to use federally owned property interests associated with the Provo River Project to address and mitigate effects of Provo River Project operations, as proposed in the PRRP, without compensation to the non-federal Provo River Water Users Association which contracts for water deliveries is quite clear.

Additionally, the authority to redress the environmental effects of the Provo River Project in such a way as to also generate a mitigation credit for the Central Utah Project is provided in CUPCA. Consequently, the benefit to the Provo River Water Users Association of having the environmental effects of the federal project from which the Provo River Water Users Association obtains water remedied with very little of the expense being paid by the Provo River Water Users Association should be obvious.

Subsection J of the Fact Finders Act (43 Stat. 703; 43 U.S.C. § 526) which was incompletely referenced in your comment applies to the distribution or allocation of any profits derived from certain actions involving Reclamation projects: "All monies or profits as determined by the Secretary heretofore or hereafter derived from the sale or rental of surplus water under the Warren Act of February 21, 1911 (Thirty-sixth Statutes, page 925), or from the connection of a new project with an existing project shall be credited to the project or division of the project to which the construction cost has been charged." (Emphasis added). The PRRP is a mitigation project, will not generate profits, and in fact is a mitigation project for the impacts of the Provo River Project. Further, subsection J specifically authorizes credit of the profits to the Project. The Provo River Project is a creation of the federal government. The Provo River Water Users Association is an organization existing under State law. Consequently, if there were any money or profits resulting from "the connection" of the PRRP with the Provo River Project, such monies would be credited to the account of the federal project within the federal Treasury and not provided to the non-federal Provo River Water Users Association. Moreover, the Provo River Water Users Association was required, by statute, to repay allocated Provo River Project construction costs as the price for water delivery from the federal project. The Provo River Water Users Association acquired no ownership interest in the project features by repaying the allocated cost of project construction as the price of water such that the use of those federally owned features by the federal government for the purpose of addressing the environmental impact of the Provo River Project operations would require compensation to the contracting parties.

12.4 Please see comment responses 12.1, 122, and 12.3.

12.4 Cont. until the Commission and/or CUWCD assumes in writing the full responsibility therefor and agrees in writing to indemnify and hold PRWUA harmless from any claims or damages which might result from the PRRP.

Under Subsection J of the Fact Finders Act of December 5, 1924 (43 Stat. 703; 43 U.S.C. § 526) PRWUA is entitled to compensation to the extent the Proposed Action will utilize the lands and easements acquired for the Provo River Project and PRWUA is entitled to compensation for the imported rock and materials hauled in and used in the construction of the existing dikes and levees to the extent that the Proposed Action will utilize those rocks and materials in the construction of the new dikes. Such compensation should be measured by the costs incurred by PRWUA therefor in the form of a reduction in PRWUA's repayment obligation, which should be readily available in the records of Reclamation.

Respectfully submitted,

N P Sefakis

N. P. Sefakis
President

NPS/JN/dwb
cc: Charles A. Calhoun, Regional Director
U.S. Bureau of Reclamation
Bruce C. Barrett, Area Manager
U.S. Bureau of Reclamation
Karen M. Ricks, Project Manager
Central Utah Water Conservancy District

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State of Utah

GOVERNOR'S OFFICE OF PLANNING AND BUDGET
Resource Development Coordinating Committee

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UTAH CENTENNIAL 1896-1996

August 13, 1996

Karen Ricks
Central Utah Water Conservancy District
355 West 1300 South
Orem, Utah 84058-7303

SUBJECT: Provo River Restoration Project
State Identification Number: UT960617-010b

Dear Ms. Ricks:

The Resource Development Coordinating Committee (RDCC), representing the State of Utah, has reviewed this proposal. Comments from State agencies are as follows:

Department of Natural Resources

The Department of Natural Resources generally supports the proposed action for the Provo River Restoration Project. However, DNR believes that the local communities should play a key role in the project's implementation. DNR supports the position of the local communities regarding this project and believes that all participating agencies should address local needs and concerns.

General Comments Provo River Restoration Project

The Divisions of Parks and Recreation, Water Resources, Water Rights and Wildlife Resources reviewed and commented on the document. There could be an increase in consumptive use of water along the river due to the side channels and constructed wetlands depending on the alternative selected. Whose water will be used? If water is purchased for this purpose, it must also be regulated. Another impact of concern is the operation and maintenance of diversion dams and measuring devices. Will the proposed rock weirs require increased maintenance? How reliable are they as measuring devices?

13.1

A study was accomplished in 1993 under Cooperative Agreement No. 1-FC-40-11510 between the Utah Division of Parks and Recreation and the U.S. Bureau of Reclamation, entitled: Provo River Recreation Study and Conceptual Plan, August, 1993 (142 pages and technical appendix). This study is nowhere noted in the DEIS.

13.2

Responses to Comment Letter No. 13

13.1 The difference between water losses in the main channel and water losses in the side channel probably are insignificant and not measurable. However, there will be additional evaporation and seepage losses in constructed ponds and wetlands. The Commission would obtain and transfer sufficient water rights to cover these losses, but the specifics of water right acquisition is not known at this time. During the final design phase, the Commission would determine, with concurrence of the State Division of Water Rights, the exact water quantity needed (please refer to section 1.7.2.2 in Chapter 1 of the Draft EIS for a discussion on water losses).

13.2 This report was cited in the References Cited. However, it was cited as the Bear West Study (see the Draft EIS, References Cited page R-1).

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Specific Comments Provo River Restoration Project

13.3 **P 1-2 Left col., 1st para**. The 1988 Aquatic Mitigation Plan for the SACS of the Bonneville Unit "(USBR 1988b)" does not match the reference in the **References Cited**. It should be correctly cited and referenced as originating from the **USFWS** in 1988.

13.4 **P 1-2 Section 1.3 Second para.** On" foot" is probably the "wrong term" to use in view of the Americans with Disabilities Act (ADA) requirements and reasonable access for non-ambulatory and wheel chair users.

13.5 **P 1-24 Section 1.7.2.2** There is not a water supply identified to provide the flows in the side channels. Water diverted from the river and supplied for consumptive use within the proposed riparian zone must be diverted under a valid water right.

13.6 **P 1-24 Section 1.7.2.2** Purpose of side channels is to provide additional aquatic habitat diversity for fish and other wildlife. An abundance of literature exists that shows most species of fish to have adverse effects on amphibians populations. If fish, particularly trout, were present in these wetland areas, the side channels may not be suitable for amphibians.

13.7 **P 1-24 Right col., 3rd & 4th para. sec. 1.7.2.2 Side Channels**. First of all, side channels should have a specific purpose if they are to be constructed. We agree that the use of small pipe or buried infiltration trenches to divert water into side channels needs to be evaluated and experimented. It would seem that a small natural open channel for inflow and outflow from these would be better and less restrictive to fish movement in and out. The document should also recognize that beaver are going to utilize the small channels and will probably seek to "improve" on anything which is done.

13.8 **P 1-24 Side Channels**. Once the Provo River area is rehabilitated to as normal or as natural a condition as possible, we have to step back and let natural processes occur. Some side channels may become clogged with vegetation or other debris as a result of the natural processes. We need to recognize this process, and also recognize that such channels may add to the diversity of habitat and in fact provide some of the slow water habitat that seems desirable for such non-game species as leatherside chub. We need to recognize and ensure that maintenance measures do not impact these types of aquatic habitat.

13.9 Cont. **P 1-25 Left col., 3rd para., Side Channels, cont**. To acquire all the land necessary for the PRRP the Commission will buy land with 3.5 cfs attached to it. Only 1 cfs will be needed to compensate for consumptive use by the side channels and

13.3 Thank you for your comment. This change has been made to the References Cited list in the Final EIS.

13.4 The term "pedestrian" will be substituted for "on foot." However, note that full access would only be provided at the seven designated access points. Wheelchair access is not proposed for the entire project area or for any areas beyond the developed access points.

13.5 Although Section 1.7.2.2, Chapter 1 of the Draft EIS recognizes the need to obtain a valid water right to support off-channel features, specifics for obtaining this water supply have not been determined at this time. Please refer to comment response 9.11.

13.6 The Wasatch population of spotted frogs co-evolved with a variety of native fish within the Provo river drainage. Geomorphologists describe the pre-settlement Provo River in Heber Valley as a multiple channel system. The natural side channels of this system were, most likely, habitat for both fish and spotted frogs. While it is known that exotic fish prey upon frogs, there are several locations along the Provo River, where spotted frogs have been documented to coexist with trout (e.g., in Condie pond and Reach 2 of the Provo River). Most likely, this coexistence is possible due to habitat variability that allows the frogs to avoid predators. While some predation would occur in side channels, the side-channel habitat features, and the habitat variation they provide, should benefit the frogs in many ways. For example, these small channels would provide a water source for a variety of wetlands types and a conduit for frog migration. Other wetlands (for instance most Bureau Mitigation wetlands) would not be accessed by side channels.

13.7 Please refer to Chapter 1, the first paragraph of Section 1.7.2.2 in the Draft EIS which lists the purposes of side channels.

13.8 The maintenance/management plan referred to in Chapter 1, Section 1.7.4, of the Draft EIS which will be developed during final design, will recognize the need to let natural processes "take their course" within the project area. The purpose of maintenance will not be to retain the riverine features in exactly the condition for which they were originally designed as long as natural changes are consistent with the objectives for the PRRP and public safety considerations.

13.9 It should also be recognized that many of the irrigated lands proposed for acquisition under the PRRP are actually irrigated via shares of stock held in mutual irrigation companies. Change applications on such shares are not easily accomplished as applications to do so require the consent of the irrigation company. Therefore, it is anticipated that any water right changes along the Provo River will involve considerable planning and negotiations. These will be accomplished during the final design and following land and water acquisition.

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13.9 Cont. ponds. We should investigate whether an exchange could be made of any "surplus" water down to the lower Provo River, where June sucker may be benefitted. This instream flow would be equivalent to the consumptive use portion of the 2.5 cfs "excess" water right acquired with the property. We perhaps should talk with the USFWS to gain their insight on this item, since they are the steward agency of TES.

13.10 **P 1-26 Sec. 1.7.2.6 Public Access.** The river corridor should be continuous, publicly owned, and uninterrupted by "islands" of private ownership. Private inholdings would only lead to major problems in the future, especially if the District or Commission "assumes" the "islands" are part of the public access, and the actual owner doesn't have the same assumption.

13.11 **P 1-26 Section 1.7.2.5** Encroachment on USBR mitigation ponds below Jordanelle could significantly impact spotted frog populations which are currently colonizing these areas. UDWR has monitored these areas since the translocation of spotted frog and they are now using these areas as breeding sites.

13.12 **P 1-30 Section 1.7.3.1** Construction procedures for the proposed project indicate that water releases from Jordanelle Reservoir could be manipulated and then managed for a period of 5 years to prevent flood flows. Flood flows are vital for maintaining channel characteristics and associated wetlands. Caution should be taken not to create further impacts on June Sucker spawning activities in the lower Provo River, which depend on periodic high flow conditions.

13.13 **P 1-30 Section 1.7.3.1** Significant impacts can occur to fish and wildlife species due to heavy machinery and construction activities. It is indicated that intensive out-of-channel activities for construction of side channels, ponds and setback dikes will occur from May - July. This period falls within the reproductive season of most wetland species (spotted frog tadpole hatching and development, nesting birds etc.). Specific and special care needs to occur to protect fish and wildlife from inadvertent impacts.

13.14 Cont. **P 1-31 Section 1.7.4 Third Paragraph,** There needs to be detailed clarification and agreement as to the responsibilities of each individual water user or water user entity. Water users must acknowledge and accept their responsibilities. Typically, if the river channel or flows are altered, the entity making the alteration is responsible for the problems they impose on other water users. Irrigators are not the only water users with these responsibilities. The CUWCD has responsibilities relating to conveying their storage water past Heber Valley

13.10 Thank you for your comment. This is why the Proposed Action has been revised to include the Core Area and Expanded Restoration Area. Please refer to Sections 1.3.2.1 and 1.5.2.6, Chapter 1 of the Final EIS for more information.

13.11 The Commission recognized that the Wasatch population of spotted frogs could be significantly impacted by the Proposed Action. Additional information was needed about spotted frogs in Heber Valley to determine the extent of potential impacts and to develop measures of impact avoidance. Therefore, the Commission provided funds for a thorough survey of the Provo River Corridor by UDWR, as well as for a detailed study of habitats in which the frogs occur. The results of these studies were then used to determine the extent of PRRP impacts on spotted frog habitats. The results will also be used to develop restoration designs for some wetlands under the Proposed Action. In addition, the Commission has organized a Spotted Frog Advisory Team to help ensure that significant impacts to spotted frog will not occur under the Proposed Action or alternatives. This team is composed of some of the nation's leading spotted frog experts, as well as state and federal wildlife officials (see Section 4.2.2.2 and Appendix H in the Final EIS). Based on the team's recommendations, the Commission has adopted a plan (see revised SOPs in Chapter 1, Section 1.9.6.1 of the Final EIS) designed to protect spotted frogs during construction and enhance frog habitat during river corridor restoration. The recommendations from the team are listed in Appendix H. With implementation of these recommendations the team believes that impacts to the spotted frog population would not be significant during construction, and that the Proposed Action would have long-term benefits for the spotted frog population. Also please refer to the revised spotted frog section in Chapter 3, Section 3.7.6.3.4 in the Final EIS.

13.12 Water releases from Jordanelle Reservoir would be managed first in order to meet requirements for delivery of downstream water rights and/or water contract requirements, and for flood control in accordance with USBR guidelines.

Flow requests that may be made by the Commission to encourage a small degree of overbank flooding and scouring to encourage riparian vegetation recruitment but to avoid excessive scour which might be detrimental before riparian vegetation is well established, would be coordinated with all relevant and involved parties. These requests would be made within the framework as identified in the above paragraph. Such requests would not affect flow regimes downstream of Deer Creek Reservoir and therefore would have no effect on the June Sucker or its habitat in the lower Provo River.

13.13 To the extent possible, construction activities will be timed to reduce impacts on wildlife, see SOPs in Chapter 1, Section 1.9.6.1 in the Final EIS. However, some short term impacts are necessary to achieve the project goals that will benefit many wildlife species. As part of project planning, the Commission has included many provisions to avoid, reduce, and mitigate impacts. These include 1) phasing the project so that only one segment of the river is impacted at a time (refer to Chapter 1, Section 1.7.3.1; in the Draft EIS), 2) avoiding centers of spotted frog activity and mitigating for unavoidable impacts to known frog habitat (these areas are also important areas for other wildlife) (refer to comment response 13.11, Appendix H, and Sections 1.9.6.1 and 3.19.3.2 in the Final EIS); and 3) reducing or eliminating planned construction impact in areas of greatest breeding bird diversity and largest areas of intact riparian forest (i.e., reaches 9 and 4) (refer to Map A-1, and the Final EIS Sections 1.9.6.1 and 3.6, and the Final Wildlife Technical Report, Section 3.2.2). These measures should reduce impacts so they are not significant for most wildlife species.

13.14 The PRRP management agreement referred to in Chapter 1, paragraph 1 of Section 1.7.4 of the Draft EIS could involve several agencies with varying responsibilities. This agreement will be worked out during final design and implementation. Additional information concerning management responsibilities and funding sources has been added to Chapter 1, Section 1.4.2 of the Final EIS. Also see Table 1-18 in Section 1.10, Chapter 1 of the Final EIS for a list of the agreements among various entities which may be required to implement some PRRP alternatives.

At present there are no plans by the Mitigation Commission to install additional measuring devices (e.g., stream gages) on the Provo River to monitor low flows. Existing gages are adequate to measure stream flows.

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13.14 Cont.

diversions. The PRWUA has responsibilities relating to the conveyance of import waters to Deer Creek Reservoir.

There is no mention of maintenance of measuring devices needed to bypass the 125 cfs instream flow. If vortex rock weirs are used as diversion dams or measuring devices, who is responsible for their operation and maintenance? Who will be responsible for damages to such devices caused by high flows?

13.15

P 1-35 P 1.8.1.1 Features Common to All Reaches, While this section is just a common description of elements we feel compelled to make brief comments on a couple statements just to insure they are not overlooked. First, the **vortex rock weirs** (right col., 2nd para.) are excellent for uses proposed; however, there is no mention that the center of these structures must be lower than the sides in order for them to function properly. Rosgen-type weirs are also constructed with very large rock and spaces occurring between rocks rather than as a solid barrier. Secondly, it is indicated that vortex rock weirs will be used to replace concrete and log sills for diversion purposes (page P 1-37, left col., 1st para.). Careful consideration needs to be applied in these instances as a weir, properly constructed, pulls water to the center of the channel and thus may be inhibiting, to some degree, diversion flows near them.

13.16

P 1-37 Left col., 2nd para. The last paragraph in this section refers to **crossings by roads, railroads, and utility pipelines**. The use of large rock to protect abutments and piers, if not given careful consideration when placed, can cause considerable change in the stream hydraulics. Consideration needs to be exercised, when creating a channel constriction, to downstream characteristics for resisting or dissipating the increased velocity, if there are no alternatives to the channel constriction. Protection of abutments and piers should be carefully reviewed on a case-by-case basis by persons experienced in stream geomorphology and stream dynamics.

13.17 Cont.

P 1-47 Left col., 3rd para. Sec. 1.9.3.1 Typical Construction Procedures, We disagree with any thought of needing to **cable structure boulders together for stability**. If proper sized materials are used (i.e. large enough rock) and they are properly placed, then cabling them together will not be necessary. Log structures protruding into the stream channel **should not** be cabled to live trees. There are designs and methods for properly anchoring them into the side/bank of the channel that eliminate the need to cable them to living trees or boulders. Use of large clumps of mature willow planted in the bank near a root wad or log structure promotes rapid canopy and bank stabilization. If the Instream Structures Alternative is selected, the Clearwater BioStudies, Inc. project should be

Maintenance of vortex rock weirs and other project features designed to provide channel stability would be the responsibility of the Mitigation Commission or its assigns. These features would be designed to be stable in all but the very highest anticipated river peak flows.

13.15 Thank you for your comment. The PRRP Technical Report (CUWCD 1994a) provides additional information on design and function of vortex rock weirs in Chapters 5 and 6.

Modified rock weirs would be necessary at some of the diversions to direct the flow to the appropriate river bank. Diversion boxes or gates would be relocated to the outside of new river bends to improve operation during low flows. All of these factors are elements that will be considered in the final design phase and resolved prior to construction.

13.16 Thank you for your comment. These considerations will be taken into account during final design.

13.17 If this alternative is selected the instream structures concepts originally developed by Clearwater Biostudies, Inc. would be critically reviewed during final design based on new research and field experience with these types of structures. Please refer to Chapter 1, Section 1.9.1 in the Draft EIS.

13.17 Cont.

reviewed, especially in light of recently developed technologies for stream habitat improvement structures.

13.18

P 1-53 Section 1.11.2 Significant impacts can occur to fish and wildlife species due to heavy machinery and construction activities. It is indicated that intensive out-of-channel activities for construction of side channels, ponds and setback dikes will occur from May - July. This period falls within the reproductive season of most wetland species (spotted frog tadpole hatching and development, nesting birds etc.). Specific and special care needs to occur to protect fish and wildlife from inadvertent impacts.

13.19

P 1-64 Standard operating procedures during construction for Aquatic Resources does not mention seasonal time periods which may be sensitive for brown trout spawning and egg incubation. This needs to be incorporated into the Environmental Commitment Checklist, and measures to minimize impacts need to be described.

13.20

P 1-64 SOP's for Threatened and Endangered Species are not described in the PRRP DAIS because they are already covered in the WCWEP/DRP DEIS. However, these procedures need to clarified with concerned agencies and adequately addressed in the Environmental Commitment Checklist.

P 2-1 Section 2.3 Table 2-1 does not compare impacts on wildlife or T&E species. These impacts are briefly discussed, however, in the text.

13.21

P 2-2 Table 2-1. Under net change in wetland acres and net change in wildlife habitat acres, please clarify that the increase in wildlife habitat is wetland habitat, so readers will not need to assume that they are separate net increases in different habitat types. (This is not clear from this table, although it is explained 3 pages later in the text.)

13.22

P 3-9 Section 3.3.5.1 Improvement in water quality in the Provo River due to the Proposed Alternative, which includes the actions of removing cattle grazing and construction of ponds is beneficial to native fish species.

13.23 Cont.

P 3-12 Right col., 2nd & 3rd para. We feel it is critical that flows from Jordanelle Reservoir reach Deer Creek Reservoir in less than 12 hours, to insure that the river does not warm to much. Last week (week of July 15, 1996) Charles Thompson, Central Region Aquatics Manager UDWR, measured stream temperatures immediately below Jordanelle dam to be 10 C (50 F). It was 12 C (53.6 F) at River Road Bridge, and 15 C (59 F) at the Midway bridge. He did not measure it at the Reservoir because the water was still backed up past the

13.18 Please refer to comment response 13.13.

13.19 As stated in the Draft EIS, Chapter 3, Section 3.5.6.3.1.1 construction activity would cause temporary impacts to brown trout spawning activity. These impacts would be minimized to the extent possible, but some level of impact is unavoidable. Channel construction activity would likely be heaviest during the late summer and fall seasons to minimize impacts to breeding, sensitive, and uncommon species (e.g.. breeding spotted frogs and riparian birds) and to avoid high spring-time flows. Unfortunately, this period happens to coincide with the brown trout spawning season. The extent of impacts will be reduced to non-significant levels by conducting work in only small segments of the active channel at a time. The Provo River population can be expected to naturally recover to several times the existing population in a reasonable length of time. Therefore, changes to the Draft EIS were not felt to be necessary.

13.20 Standard Operating Procedures (SOPs) regarding threatened and endangered species have not been developed except for spotted frogs (included in the Wildlife Resources category) because the recommendations regarding threatened and endangered species for the most part are treated as mitigation measures or as conservation measures. The Environmental Commitments (Appendix D) include numerous measures to protect threatened and endangered species and their habitats.

13.21 Thank you for the comment. This change has been made in the Final EIS.

13.22 The Draft EIS recognized this beneficial impact (please see Chapter 3, Section 3.5.6.3.12, sixth paragraph), therefore no change was necessary in the Final EIS.

13.23 Temperature changes due to PRRP are described in Chapter 3, Section 3.3.6.3.1.2 and evaluated in Chapter 3, Section 3.5.6.3.1.1 of the Draft EIS. Also please refer to comment response 6.4.

13.23 Cont. Charleston Bridge; he thought it may have gained another degree or two by then. Enhancement plans and activities should keep in mind that we do not want the water to be retained in the river so long, that it warms above about 18 C (64.4 F). This concern is somewhat reduced because temperature predictions for the Proposed Action (Table 3-4) show that stream temperatures will reach a maximum of 61.3 F in the lowest reach of stream, under the worst-case mixing and dilution calculations, and that time of travel of the flow from Jordanelle Dam to Deer Creek Reservoir would be 4.9 hours.

13.24 **P 3-33 Right col., 1st para., Sec. 3.5.6.3.1** The effects of sedimentation on spawning fish are discussed as we requested for the PDEIS, but procedures and season/location of least impact should be further described in the Environmental Commitment Checklist.

13.25 **P 3-37 Section 3.5.6.3.2.2** Enhancement of habitat complexity, surface area, habitat quality etc will probably benefit non game species. However, an increase in trout standing crop is anticipated, which could significantly impact non game fish species.

13.26 **P 3-38 Section 3.5.6.3.3.1** This section indicates that no impacts during construction would occur on other aquatic resources (invertebrates/amphibians) for the same reasons listed for game fish species. Many of these species have terrestrial life stages as well as different microhabitat parameters. It is probably inappropriate to say that there are no impacts for these reasons. In addition, section 3.5.5.3 indicated no surveys were conducted for other aquatic resources, therefore, community composition in the affected area is unclear. Some species may significantly be impacted during construction.

13.27 **P 3-38 Section 3.5.6.3.2.2** Potential impacts after construction may occur in side channels and ponds if game fish have access to these areas. It has been documented that most amphibians are unable to co-exist with most game fish species.

13.28 **P 3-38 Section 3.5.6.4** Enhancement of habitat complexity, surface area, habitat quality etc will probably benefit non game species. However, an increase in trout standing crop is anticipated, which could significantly impact non game fish species.

13.29 Cont. **P 3-38** This section indicates that no impacts during construction would occur on other aquatic resources (invertebrates/amphibians) for the same reasons listed for game fish species. Many of these species have terrestrial life stages as well as different

13.24 Please refer to comment response 13.19.

13.25 Mitigation Commission scientists recognize that the presence and abundance of sport fish, such as brown trout, can have a negative impact on the behavior, abundance, and habitat selection of non-game fish. Existing habitats in the Project Area are marginal for most non-game fish species, and the populations of native fish such as the leatherside chub are low. It is unlikely that the Proposed Action would further diminish this condition. In fact the Proposed Action would create greater diversity and quantity of hydraulic habitats that are much more suitable for non-game fish than found under existing conditions. Results of fish community sampling suggest that within diverse, suitable habitats, non-game fish coexist with sport fish. Therefore, populations of most non-game fish would be expected to increase after restoration is complete. Therefore, a change in the Draft EIS impact analysis was not felt to be necessary.

13.26 The text in the Draft EIS, Section 3.5.6.3.3.1 indicates that no significant impacts are expected to occur. It does not state that no impacts would occur. Also please refer to comment response 13.13.

13.27 Please refer to comment response 13.25.

13.28 Please refer to comment response 13.25.

13.29 Please refer to comment responses 13.13 and 13.26.

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13.29 Cont. microhabitat parameters. It is probably inappropriate to say that there are no impacts for these reasons. In addition, section 3.5.5.3 indicated no surveys were conducted for other aquatic resources, therefore, community composition in the affected area is unclear. Some species may significantly be impacted during construction.

13.30 **P 3-49 Section 3.6.6.3.1.2** This section implies that the habitat created after construction will be as suitable to non-game species as the habitat lost prior to construction. Caution should be taken when assuming suitable habitat can be recreated for all species of wildlife.

13.31 **P 3-50 Section 3.6.6.3.2.2** The DEIS indicates that impacts of Proposed Action to non game species would be the same after construction. This may be an inaccurate statement. Game species and birds have very large home ranges and can travel from one source of water and suitable habitat to another fairly easily. In the case of many amphibians and reptiles, movement is limited to small home ranges. Destruction of habitat for a period of 1-30 years could cause significant declines in these taxa. Re-colonization could take a very long time.

13.32 **P 3-50 Section 3.6.6.4.1.1** This section implies that the habitat created after construction will be as suitable to non-game species as the habitat lost prior to construction. Caution should be taken when assuming suitable habitat can be recreated for all species of wildlife.

13.33 **P 3-50 Section 3.6.6.4.1.1** The DEIS indicates that impacts of Proposed Alternative to non game species would be the same after construction. This may be an inaccurate statement. Game species and birds have very large home ranges and can travel from one source of water and suitable habitat to another fairly easily. In the case of many amphibians and reptiles, movement is limited to small home ranges. Destruction of habitat for a period of 1-30 years could cause significant declines in these taxa. Re-colonization could take a very long time.

13.34 **P 3-53 Section 3.7.2** Because the Proposed Alternative suggest that flow alterations in the Provo River may occur before, during, and for 5 years after construction, June Sucker should not be removed from impact consideration. Recovery actions have been attempting to achieve the optimum flows in the lower Provo River for several years. Any alterations should be assessed by the June Sucker Recovery Team in conjunction with the Provo River Water Users. This section also indicates that June Sucker was removed under Section 3.7.2 of the WCWEP. No reference to this was made in this section of the WCWEP.

13.30 This section does not imply that habitat created will be suitable for all historic indigenous wildlife species. However, it does imply that created, improved, and protected habitats will support a greater abundance and diversity of wildlife species than the baseline condition. Also, please refer to comment response 13.13 and Final EIS sections 3.4, 3.5, 3.6, and 3.7.

13.31 Please refer to comment responses 13.11, and 13.13.

13.32 Section 3.6.6.4.1.1 does not pertain to non-game species, as implied by your comment. Therefore, no response is made.

13.33 Please refer to comment responses 13.11, and 13.13.

13.34 Please refer to comment response 13.12.

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13.35 **P 3-55 Section 3.7.6.3.4** Current actions are being taken by several agencies under a conservation agreement to conserve and provide for the continued existence of spotted frog. These actions are being taken in lieu of listing under the Endangered Species Act. Impacts as described in T&E technical report may be deemed too detrimental to the Wasatch populations of spotted frog to prevent this species from being listed as a threatened and endangered species. Restoration of the Provo River should incorporate actions that will not temporarily or permanently impact any of the populations, particularly in reaches 7, 8, and 9. All actions in these areas should enhance the survival of these species.

13.36 **P 3-55 Section 3.7.6.3.4** Temporary loss of 22.2 acres and a permanent loss of 55.2 acres of both occupied and potential occupied spotted frog habitat may severely impact the continued existence of the Heber Valley populations of spotted frog. These populations are extremely important to the continued existence of spotted frog along the Wasatch Front. Restoration of 90.9 acres could benefit spotted frog, however, the destruction of 77.4 acres and the mortality of individuals and lost reproductive success associated with habitat loss does not offset a "potential" benefit.

13.37 **P 3-55 Section 3.7.6.3.4** A major concern of UDWR is what will happen to the frogs that are there? Where will they go for 2 years in the temporarily impacted areas? The frogs in the USBR have been translocated once already. The outcome of this effort is still uncertain as to its success. These questions need to be resolved.

P 3-59 Section 3.7.6.4.4 A major concern of UDWR is what will happen to the frogs that are there? Where will they go for 2 years in the temporarily impacted areas? The frogs in the USBR have been translocated once already. The outcome of this effort is still uncertain as to its success. These questions need to be resolved.

13.38 **P 3-93 Right col., 5th para., Sec. 3.16.6.3.1** Changes in Recreation Use. We feel the estimate of increased use is ultra conservative and that usage will increase much more rapidly than anticipated. The quality of the fishing experience will be an attractant as well as public usage of an area that has for the most part been off limits. The area presently has quality fish and with improved habitat features, the numbers will increase. It's only a personal "guesstimate", but we think the 15 to 20 year predictions will be reached within 10 years. (Increased use estimates for Strawberry Reservoir were grossly underestimated after it was chemically renovated and fishing allowed.

13.35 The Mitigation Commission is participating as an active member of the Spotted Frog Conservation Team workgroup and supports efforts to conserve Spotted Frogs in Utah. Please refer to comment response 13.11 for further explanation of the actions taken by the Mitigation Commission to reduce potential adverse impacts of the PRRP.

13.36 Please refer to comment response 13.11.

13.37 Please refer to comment response 13.11.

13.38 The recreation analysis in the Final EIS has been revised. Please see the comment response 6.7 for an explanation of the new methodology.

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13.39 **P 3-105 Section 3.19.3.2** This section discusses conservation efforts to prevent mortality of spotted frog during construction. We agree that conservation measures should focus on avoiding impacts to occupied and potentially occupied habitats. Translocation of frogs should only be a conservation effort used to move frogs out of "harms way" once an unavoidable impact become certain, not as a action used to remove frogs so that the project can occur. The statement that monitoring efforts have not been occurring on past relocation efforts is inaccurate. Areas where frogs have been translocated have been monitored annually during the breeding season.

Division of Water Rights

The Stream Alteration Program of the Division of Water Rights does not endorse the concepts, modeling, terminology, or conclusions set forth in the DEIS. This office will independently review and act upon Stream Alteration Applications after they are received.

13.40 **P 1-10, P 1-49** If the channel is to be relocated or modified, the centerline should be shifted to retain a natural bank on one side, rather than constructing two new banks which must be stabilized.

For any option considered, retention of riparian vegetation is paramount. If trees must be removed, root masses should remain wherever possible to provide stability.

13.41 **P 1-19** Placement of large rocks at outside meander bends will preclude development of resisted lateral scour creating stable, undercut banks which provide excellent fish habitat.

13.42 **P 1-21** Trees should be cut prior to removal to allow retention of roots in the bank. Where the dike is removed, slight inconsistencies in elevation should not be critical to improved river/floodplain interaction.

13.43 **P 1-45** As proposed, the structure will allow no bedload transport. Bedload movement must be analyzed and accounted for in instream structure designs.

13.44 Cont. **P 1-42, P 1-43** The function of the boulder placed at the bank end of the tree is unclear. The instream boulder would need to be placed closer to the center of the log. As proposed, the structure may cause sediment to aggrade and not

13.39 Please refer to comment response 13.11.

13.40 Where it is consistent with the required geomorphic platform characteristics, existing features such as existing natural banks have been incorporated into the conceptual design as much as possible. One of the primary objectives of the final design will be to integrate the proposed features as closely as possible with existing topography, riverine features, vegetation, and habitat resources.

Preservation of riparian vegetation is paramount to a successful project. Where required topographic changes necessitate tree removal, as much of the remaining root wad as possible would be left intact to provide stability. Portions of root wads which would have to be removed would be salvaged for use in bank protection. Please refer to Section 1.7.1.1 and 1.7.3.1, in Chapter 1 of the Draft EIS.

13.41 Use of large rocks on outside bends in a manner which would prevent development of good fish habitat would only occur where potential channel migration could not be tolerated. Chapter 1, Section 1.7.1.1, paragraph 7, of the Draft EIS describes bank features and some of the measures which would be taken to provide adequate habitat conditions even when stability is of primary importance.

13.42 If the bank would remain intact, trees would not be removed. If the bank would not remain intact and trees would have to be removed, as much as possible of the root wad below the final grade line would be left intact. Root wads which would have to be removed would be salvaged for use in bank stabilization.

13.43 The rock weir shown in Chapter 1, Figure 1-9 of the Draft EIS, would have a depressed center section which would allow for bedload movement as well as assist in fish passage. This does not show up in the two views shown in the figure. The PRRP Technical Report (CUWCD 1994) describes rock weirs in more detail.

13.44 This graphic, and others similar to it in this section, was derived from a Clearwater Biostudies, Inc. graphic, and should be considered to be very conceptual. Final design of habitat enhancement structures for the Instream Structures Alternative would accommodate the concerns voiced in this comment, as well as those received from other commentors.

Karen Ricks
Provo River Restoration Project
10

13.44 Cont. provide its intended function over time. Would the remaining channel volume be sufficient to convey typical flows?

13.45 P 3-25 Will there be contingency plans to protect recovering riparian areas from herbivory? If not, recovery may be hampered or precluded.

13.46 P 3-33 Construction should be seasonal to reduce impacts to spawning trout and other riparian-associated wildlife.

13.47 In the case of the proposed alternative, the existing channel could be retained as a high flow channel while the any newly constructed channel is becoming established. This period may be 3 years or longer. Stream channel relocations can fail because of large flood events that occur shortly after their completion, prior to significant establishment of woody vegetation and associated root systems to stabilize banks. Controlling the flow of water into new channels is one way to attempt to prevent potential project failures. In section 1.7.3.1 of the document, a five year period of controlled releases from Jordanelle Reservoir is mentioned as a means of providing the project protection from severe flood flows. As mentioned in the document, such control would be contingent on the reservoir management plan, and therefore may not be a viable means of controlling flows.

The Committee appreciates the opportunity to review this proposal. Please direct any other written questions regarding this correspondence to the Utah State Clearinghouse at the above address or call Carolyn Wright at (801) 538-1535 or John Harja at (801) 538-1559.

Sincerely,

Brad T. Barber
State Planning Coordinator

BTB/ar

13.45 Fencing of the Project Area is part of all alternatives and baseline conditions. This has been clarified in the Final EIS. Please see Chapter 1, Section 1.4.1, which describes implementation of baseline conditions.

13.46 Please refer to comment response 13.13.

13.47 This suggestion will be considered when developing a phased construction and implementation plan as part of final design. Because a large portion of the abandoned existing channel would be used for disposal of spoil material generated by excavating the new channel, careful phasing would have to be devised to make the abandoned channel effective as conveyance for high flows. In addition, the Proposed Action would use the abandoned channel to create habitat features that are part of the restoration project. Therefore, the existing channel would not be available for other uses after construction.

August 13, 1996

Mr. Michael C. Weland
Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem, UT 84058-7303

VIA FAX: (801) 226-7150

RE: PROVO RIVER RESTORATION PROJECT DRAFT ENVIRONMENT IMPACT STATEMENT

Dear Mr. Weland:

Thank you for the opportunity to review the Draft Environmental Impact Statements (DEISs) for the Provo River Restoration Project (PRRP). I would like to commend all those who worked so hard to research and recommend the proposed alternatives.

14.1 I endorse and highly encourage approval of "The Proposed Action: Riverine Habitat Restoration" in section 1.3.2 of the DEIS. This is the only acceptable alternative and is the right of the people of Utah.

There has been much negative publicity in the media from Wasatch County landowners and officials. I find it odd that the very people the Central Utah Project (CUP) was designed to benefit (and it has done just that) are now crying foul when it has finally come time to mitigate the impact of CUP.

The "Proposed Restoration" is the agreed upon mitigation owed to the people of Utah.

The "Proposed Action" has focused on benefits to anglers but will also provide much needed open space for humanity and habitat for wildlife and fish.

I look forward to future opportunities to comment and move this process to completion.

Thank you,

Steve Williams

10252 Locksley Rd.
Sandy, UT 84092
801-572-2658

Responses to Comment Letter No. 14

14.1 Thank you for your comment and input. It will be used in the decision process.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control and Prevention (CDC)
Atlanta GA 30341-3724

August 12, 1996

Karen M, Ricks, Project Manager
Central Utah Water Conservancy District
355 West 1300 South
Orem, Utah 84058

Dear Ms. Ricks:

We have completed our review of the Draft Environmental Impact Statement (DEIS) for Wasatch County Water Efficiency Project and Daniel Replacement Project, Central Utah Water Conservancy District. We are responding on behalf of the U.S. Public Health Service.

15.1 We believe public health concerns have been addressed in this draft document. We agree that the hazardous material procedures included under the health and safety standard operating procedures (SOPs) and the erosion control SOPs should minimize or avoid adverse water quality impacts. Also, we noted that the Utah Occupational Safety and Health Act and the conditions set forth in the federal Occupational Safety and Health Standards will be followed during construction, operation and maintenance.

We were pleased to note that drinking water wells potentially affected by drawdown of groundwater levels will be closely monitored and mitigated whenever necessary to ensure a safe and adequate supply of drinking water.

Thank you for the opportunity to review and comment on this draft document. Please ensure that we are included on your mailing list to receive a copy of the Final EIS, and future EIS's which may indicate potential public health impact and are developed under the National Environmental Policy Act (NEPA).

Sincerely,

Kenneth W. Holt

Kenneth W. Holt, M.S.E.H.
Special Programs Group (F29)
National Center for Environmental Health

Responses to Comment Letter No. 15

15.1 Thank you for your comment.

Comment Letter No. 16

August 13, 1996

Provo River Restoration Project
Michael C. Weland
Utah Reclamation Mitigation and Conservation Commission
355 W 1300 S
Orem UT 84058-7303

Dear Mr. Weland,

16.1 I am writing to state my full support for restoration of wetlands in the Heber Valley as part of the Central Utah Project Completion Act.

Several factors have influenced my support: The case currently being made for wetlands nationally including, their benefit in reducing effects of flooding; and the ability of wetlands to hold water and release it slowly in times of drought. Wetlands also are criticle habitat for many endangered species as well as ducks and other game birds and their ecosystems.

I believe the greatest thing influencing my support is the rapid growth taking place not only along the Wasatch front but also in the Heber Valley. The public access to this land will be priceless in two or three generations when our farmlands and open spaces are eaten up by housing developments. This river basin will be used by the entire Wasatch community as a green land which we will not be able to afford in the future as land prices go through the roof.

I realize there has been much opposition in this valley. People who say we have given enough to the recreation of the Wasatch Front. I would argue that we have given nothing to nature. We have taken the water, taken the land taken the clean aire and we give back to the land our trash. This is an opportunity to protect our dwindling natural resources for future generations.

I do not believe leaving a post card of "how it used to be" is good enough for the future generations of Utahns.

Sincerely,

Ann Zuspann
PO BOX 657
MIDWAY UT 84049

Responses to Comment Letter No. 16

16.1 Thank you for your comment and input. It will be considered in the decision process.

Anglers' Inn
Fishermen Serving Fishermen

August 12, 1996

Michael C. Weland, Executive Director
Utah Reclamation Mitigation and
Conservation Commission
355 West 1300 South
Orem, UT 84058-7303

Dear Mr. Weland:

I am writing this letter as a member of Sportsmen for Fish and Wildlife, an avid outdoor enthusiast and as a person who is involved in a business that relies on quality fisheries to support it (Anglers' Inn, Inc.). Utah's great outdoor quality of life is also why I, along with many others, choose to reside in this state.

17.1 This letter is my endorsement to support the proposed action on the Provo River Restoration project. The River Habitat Restoration would provide immense recreational benefits to sportsmen and women for generations to come, not to mention the tremendous economic benefits that a "blue ribbon fishery" brings to the local and state economies.

With the limited resources in this desert state, there are not many opportunities that the U.R.M.C.C. will have that will make such a large difference and benefit so many people because of its proximity to a large urban area.

From my discussions with a great number of sportsmen, I feel many share the same opinion as I that the Provo Restoration Project is a tremendous opportunity. We feel the benefits greatly out weight any negative impact. Thank you and all the U.R.M.C.C. for your consideration.

Sincerely,

Patrick A. Milburn

Patrick A. Milburn

FAMOUS FOR THE LARGEST VARIETY OF TACKLE
Anglers Inn

2292 HIGHLAND DRIVE, SALT LAKE CITY, UTAH 84106 • PHONE (801) 466-3921 FAX (801) 483-1885

Responses to Comment Letter No. 17

17.1 Thank you for your input. It will be considered in the decision process.

United States Department of Agriculture

Natural Resources Conservation Service

P.O. Box 11350
Salt Lake City, UT 84147
Phone: (801) 524-5051

August 12, 1996

Karen M. Ricks, Project Manager
Wasatch County Water Efficiency Project
Central Utah Water Conservancy District
355 West 1300 South
Orem, UT 84058

Dear Karen:

The Natural Resources Conservation Service (NRCS) appreciates the cooperation, dialog and data sharing from Central Utah Water Conservancy District (CUWCD). In general, the NRCS concurs in the analyses presented in the Wasatch County Water Efficiency Project (WCWEP) Draft Environmental Impact Statement (DEIS). Along with other resource agencies, we have been involved in the planning and coordination of the WCWEP in conjunction with the Tri-Valley Watershed Project. The NRCS supports the WCWEP. We have the following comments:

Section S.3.3.2 Non-Federal Cost Sharing: Last sentence states that "The cost sharing requirements associated with 202 and 207 would be met". More information is needed on who will meet.

Section 1.3.2, 1st paragraph: Text states "Although not part of the Proposed Action, on-farm conversion to sprinkler irrigation systems would occur" and Section 3.1.2, last paragraph, states, "all of the analysis ...was conducted assuming the on-farm improvements are implemented." It would clarify the Environmental Consequences in Chapter 3 if the Introduction (3.1) stated, "The purposes of this chapter are to describe...resources that would be impacted by the Proposed Action plus the on-farm improvement that will be installed through the Tri-Valley Watershed..."

Section 1.7.1.2.1, 2nd paragraph: Instead of saying "(not including projects in Midway)", the first sentence of this paragraph should read, "As of May, 1996,.....construction in Heber Valley excluding the town of Midway."

Section 1.7.1.2.3: States the Tri-Valley Watershed Plan is scheduled for completion in 1996. The Draft Watershed Plan/Environmental Assessment should be completed in 1996 but the Final may not be completed until early 1997. Since the fact that the projects are voluntary is stated in the 7th line, the phrase "which would be voluntary and take longer to implement" in the

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19th and 20th line and "in the voluntary portions of the plan" in the 23rd line should be removed. The sentence starting in line 22 should be changed to read, "Based on experience in similar projects, NRCS expects participation in the water quality elements to increase after the effects of the demonstration project are observed by local people."

Section 1.8, 2nd paragraph: Section 303 funds and Section 202 and 207 funds don't mean much to anyone not familiar with the Central Utah Project Completion Act.

Section 1.8.4.1 Description of Facilities: 6th paragraph Figure 1-7, schematic on next page W 1-42. Recommend including screening devices for moss. You may need structures to remove sediment from the water as well.

Section 1.11: Statement after the 8th bullet, "The Mitigation Commission..." does not fit the introductory statement, "no changes in the following."

Section 3.1: The "Introduction" would be a good place to define baseline conditions.

Section 3.1.2.1.2, 2nd paragraph: In the 11th line delete, "in Round Valley (Wallsburg) and".

Section 3.1.2.2 Don't see the acronym HCSS written out prior to using it.

Section 3.2.5.4.2, 2nd paragraph: Reference is made to three ditches and one creek. The next sentence refers to "These creeks". The text should either say "These ditches and creeks" or explain that what are referred to as ditches are actually creeks.

Section 3.3.5.2.2: Second reference to a table should be "3-20" instead of "3-19".

Section 3.2.5.8.3: Wells & Springs--Third sentence seems unclear because of the words "Total pumping by all of the wells." We assume you mean pumping of each of the 640 active wells averages 1.2 cfs or 870 acre-feet per year.

Section 3.3.6.1, 2nd paragraph: It would be more accurate to state "Since there are no numeric standards" NRCS will be using the narrative standard for TSS. Also, there is a "pollution indicator" for P in the state standards.

Section 3.11.6.2, 3rd paragraph: Text states that "on a per acre basis, the total amount of water used by municipal and industrial uses approximates the total used by agriculture." This should be more specific. Does it refer to industrial use as well as municipal (household or culinary use would be more descriptive)?

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I assume the reference to agriculture means irrigated agriculture.

Table 3-27: The figures 20.7 and 2.1 in the first line should be negative.

3.12.6.3.8: Text states that "sprinkler systems require more labor to maintain than flood irrigation." NRCS investigation shows that about the same amount of labor is needed to operate flood systems as sprinkler systems. However, the cost of the labor is lower because it is unskilled. Maintenance costs of sprinkler systems are expected to be lower than flood systems.

3.21.2.11, 4th paragraph: Text states that "impacts of the Tri-Valley Watershed Plan ....are not readily quantifiable." Since these impacts will be addressed in the Watershed Plan, it would be better to state that "impacts are not available."

The only comments on the Provo River Restoration Project (PRRP):

18.1 Section S.1.3 Description of the Proposed Action and Alternatives. In the middle of paragraph, it states "there will be public access from Jordanelle Reservoir to Deer Creek Reservoir; and fencing of this public access. The width of the public access would basically be the area between the outside edge of the existing dikes, or an area extending about 50 feet beyond the existing channel banks in undiked sections of the river. These commitments will be implemented regardless of a decision to implement the PRRP described in this EIS." From observing the public hearing in Heber, it appears this strong language has created much animosity toward the PRRP because several people who spoke said "it sounds like you are going to do this project no matter what we say or do." You may want to give a more complete explanation of the document that contains this commitment and list the page and footnote for this commitment.

Sincerely,

Marilyn A. O'Dell
acting for

PHILLIP J. NELSON
State Conservationist

cc:
Gary Nordstrom, Director, BCS

Responses to Comment Letter No. 18

18.1 The Final Environmental Impact Statement for the Municipal and Industrial System (USBR 1979) discusses fishery and recreation access as follows (p. A-20):

> " To maximize fishing and other recreational opportunities below Jordanelle Reservoir, public access would be provided by the acquisition of 7 miles of 50-foot wide access lanes each side of centerline of the river or a minimum of about 25 feet of bank on each side. These acquisitions, along with 3 miles of river already in public ownership immediately upstream from Deer Creek Reservoir, would make the entire river between the two rivers open to the public. Seven vehicle pull-offs would be built at 1- to 2-mile intervals along the river, as shown in Figure A-5. Accommodating up to 700 people at one time, they would include car parking areas, restrooms, and launching ramps for kayaks, canoes, and rafts. The boundary of the access lanes would be fenced, unless suitable fencing already existed, and turnstiles would be provided at the entries to the vehicle pull-offs in order to close the facilities nightly and for management purposes as required by the State. Existing diversion structures in this section of river would be modified to afford greater safety to whitewater boaters. The Utah Divisions of Parks and Recreation and Wildlife Resources have indicated the intention to effectively manage this area and the Bureau has requested written verification of this commitment. The area would be managed so as to combine recreational use with measures for the protection of adjacent property owners from trespassing and vandalism."

The Final Supplement to the Final Environmental Statement for the Municipal and Industrial System (USBR 1987) revised the fishery mitigation and recreation as follows (p. 33):

"In order for Reclamation to meet its mitigation commitments, fisherman access to this reach of the Provo River would be modified as listed below:

1. Foot access for fishermen only.
2. Access will be acquired for fisherman use through fee title or easement at such time as a managing agency is identified.
3. Minimal facility development, such as parking and restroom facilities at each access point shown in Figure 7."

A new section, Section 1.4.1, Implementation of Baseline Commitments for the Provo River Corridor, has been added to Chapter 1 of the Final EIS. This section describes the requirement to implement the baseline angler access commitments already in effect, and how completion of that requirement will be integrated with implementation of the PRRP.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

AUG 13 [illegible]

Ref: 8EPR-EP

Mr. Michael C. Weland
Executive Director
Utah Reclamation, Mitigation and
Conservation Commission
355 West 1300 South
Orem, UT 84058-7303

Re: Comments on Draft Environmental Impact Statement, Provo River Restoration Project

Dear Mr. Weland:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the U.S. Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the Provo River Restoration Project. As you are aware we have participated in the development of this document for several years and have provided comments on previous documents and reports which support this document. EPA offers the following concerns and comments for your consideration as you complete the Final Environmental Impact Statement (FEIS) and your decision making process.

19.1 We have two basic concerns with the document. First, the document appears to gloss over the temporal impacts associated with the long term construction period proposed. The document recognizes that the project may require 30 years to construct, but it does not seem to recognize that the loss of the existing resources may not be fully replaced until sometime after that 30 year period. EPA recognizes that the project will be built in phases, however we believe the document should better indicate how sensitive biological communities such as spotted frogs and native wetland plant communities will survive if their habitat is eliminated for several years before it is ultimately replaced.

19.2 Cont. The other concern is the lack of analysis of the future recreational uses of the project area. The DEIS implies that one of the primary purposes of the restoration project is to replace stream recreational uses lost as a result of previous activities. This document needs to include a detailed analysis of what the future recreational uses will be in order to allow the decision

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Responses to Comment Letter No. 19

19.1 Temporal impacts associated with construction will only last for one to two years for any construction segment. After construction, the Project Area should quickly recover. One needs only to examine the Bureau constructed wetlands to see the kind of dramatic improvement that can occur in a relatively short period of time. These wetlands provide some of the best spotted frog and wetland plant habitat in Heber Valley. Moreover, the construction process, for all river segments, will last for less than ten years. The EIS states that recovery of mature cottonwood trees may take from 10 to 30 years, but the recovery would start immediately after construction with early-seral riparian vegetation colonizing disturbed areas. Since this vegetation type is disproportionately under represented within the Project Area, we feel that this addition may improve habitat diversity, thereby improving conditions for many wildlife species. In addition please refer to comment responses 13.11, and 13.13.

19.2 The Draft EIS has been revised to clarify the recreational uses that would be allowed. Please see Chapter 1, Section 1.4.2, in the Final EIS. The Mitigation Commission proposes to develop an operating agreement(s) with Wasatch County, the Utah Division of Wildlife Resources and possibly other appropriate entities for management of the corridor. The Operating Agreement would identify and specify facility, infrastructure, and recreational user objectives, as well as biological resource objectives. The Operating Agreement will identify primary areas of responsibility and authority, specify costs of management, and commit funding sources to support ongoing development, operation and maintenance, and management of the project.

The recreation analysis has also been revised. Please see Chapter 3, Section 3.16 in the Final EIS. Appendix B2.15 in the Final EIS describes the methodology used to forecast this level of use.

19.2 Cont. maker to determine if the proposed action can meet the project purpose. It is not enough to conclude that since the stream is restored, the purposes for the restoration have been met. Also, the ultimate recreational uses and management of the stream corridor will have a great impact on the resource improvement projections made in the DEIS.

Based on the concerns stated above, and the procedures EPA uses to evaluate the potential effects of proposed actions and the adequacy of the information in the DEIS, the proposed action presented in the DEIS will be listed in the Federal Register as a Category 2. This means that EPA believes additional information related to project impacts and the recreational analysis needs to be presented in the FEIS in order to meet the NEPA requirements. This information is necessary to adequately address the differences between the alternatives. Please have your staff contact Dave Ruiter (303/312-6794) concerning the details of our comments.

Sincerely,

Dave Ruiter

for Carol Campbell, Director
Ecosystem Protection Program

cc: CUWCD, Provo

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Member Groups:

Audubon Council of Utah
High Country Flyfishers
Salt Lake Fish & Game Assoc.
Sportsmen for Fish & Wildlife
Stonefly Society Chapter of Trout Unlimited
Sundance
Utah Rivers Conservation Council
Utah Chapter, The Sierra Club

UTAH OUTDOOR INTEREST COORDINATING COUNCIL

Jeffrey W. Appel, OCL and Executive Director
9 Exchange Place, Suite 1100
Salt Lake City, Utah 84111

Tel: (801)532-1252
Fax: (801)532-1278

August 20, 1996

Karen Ricks
Project Manager
WCWEP, PRRP and DRP
Central Utah Water Conservancy District
355 West 1300 South
Orem, Utah 84058-7303

RE: UOICC Comments on WCWEP/PRRP/DRP

Dear Karen:

Please consider this letter as the cover letter for the comments recently submitted by several of the UOICC members on its behalf. We look forward to continued and heightened involvement in the NEPA process and on these projects. We would be happy to provide further explanation of any comments if questions arise. Thank you for the opportunity to participate in these important projects.

Very truly yours,

UTAH OUTDOOR INTEREST COORDINATING COUNCIL

Audubon Council of Utah

Sundance
by Jeffrey Appel

High Country Flyfishers

Utah Rivers Conservation Council

Salt Lake Fish & Game Assoc.

Utah Chapter, The Sierra Club

Patrick Milburn
Sportsmen for Fish & Wildlife
by Jeffrey Appel

Stonefly Society Chapter of Trout Unlimited

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UOICC COMMENTS TO
DEIS
PRRP

C/O
Michael C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem, UT 84058

(#1 of 2, See Map)

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PRRP COVER LETTER

The UOICC is entirely in favor of the Proposed Action (Riverine Habitat Restoration) for the Provo River Restoration Project if the suggestions mentioned herein are considered in the final design process and responded to in the Final Environmental Impact Statement. By restoring the river from the Jordanelle Dam, working downstream to Deer Creek Reservoir, it is thought that great benefit for local landowners, wildlife enthusiasts, and stream fishermen will be realized over the years following the completion of the various reaches of river.

20.1 Reaches 2, 4, 7, and 9 offer the best opportunities for full restoration to fully functional river sections, capable of meandering freely within the constraints of the 100-year floodplain boundaries, often determined by the setback dikes. Reaches 3, 5, 6, and 8 offer only limited opportunities of full restoration, but a somewhat 'fixed' sinuous alignment will be a significant improvement over all other alternatives. Reach 1 (not shown) does not qualify for the Proposed Action, but does, however, qualify for the Existing Channel Modification Alternative. And, only reach 4 (the braided/non-channelized section) could 'self-improve' under the non-action alternative if easements could result in an unmolested 100-year floodplain wide enough to allow for a natural meander. The In-stream Structure Alternative is a totally inappropriate consideration for the Provo River between Jordanelle and Deer Creek Reservoirs, except in a very limited stretch immediately below the railroad trestle in Reach 2 (in the 'new' proposed Reach 1).

20.2 The UOICC high recommends that both Berkenshaw Creek to the West and Westside Ditch 1, 4 to the east of the PRRP be considered as side channel options in light of their significant contributions to the project at a substantial savings.

20.3 It is stated in many places (3.4.6.33, paragraphs 123 & 124, p3-22; 3.4.6.44 paragraph 139, p 3-28; 3.5.6.3.I.1, paragraph 165, p3-37; 3.5.7.4.11, paragraph 197, p. 3-43 3.6.6.3.1.1, paragraph 262, p 3-55, paragraph 264, p 3-56, paragraph 267, p 3-57; et cetera) that the recovery of the area would take 15 to 30 years. The major reason for this inappropriately longtime is that many large trees will be removed during construction and current intention is to replace the large trees by planting seedlings or saplings (the size of the replantings is not specified). This seems ridiculous. It is well known that multi-tiered habitats are very important to the establishment of many bird species, as well as variety of mammals. More mature cottonwooods should cost about $300 each and planting would, presumably, be about as much. This means that 1000 substantial cottonwoods could be planted for about $600,000. In addition to its benefit as wildlife habitat, rapid reestablishment of bank and shoreline vegetation will moderate water temperature increases.

Responses to Comment Letter No. 20

20.1 Thank you for your suggestions. They will be considered in the decision making process and in the final design phase of the project.

20.2 The present Proposed Action does not incorporate Berkenshaw Creek and Westside Ditch as side channels as part of the project because they are relatively far from the existing channel. Adding these channels to the project would require acquisition of a considerably wider river corridor (i.e., all the area between the side channels and the main channel would have to be acquired). However, we recognize that these existing features could be valuable additions to the PRRP project. If negotiations with landowners regarding property acquisition make it feasible, these features could possibly be added to the PRRP during final design.

20.3 Thank you for your suggestion. Please refer to comment responses 13.13, and 19.1.

PRRP COMMENTS

20.4 P1-3 **General** - There is no discussion of how the various reach designations were chosen and the criteria used to define them. Why? The ultimate Proposed Action features do not fit the proposed reach designations in a common sense way to yield a functional plan in all reaches. Why is this?

20.5 **1.3.2, Paragraph 2** - As described here, this side channel/pond concept sounds very artificial and vulnerable to the natural meanderings of the 'more naturally functioning riverine ecosystem' alluded to in S.1.1 paragraph 2. Ponds, such as these, do not naturally occur in the context of such an ecosystem, rather, they exist as abandoned channels as the result of natural meandering (movement). The Proposed Action should, therefore, consider utilizing the old channel (because it already exists) to create more natural backwater and off channel ponds complete with their more natural emergent vegetation zones at a substantial savings to the project.

Potential side channels, such as Berkenshaw Creek and Westside Ditch 4, already exist and would benefit the system immensely by the addition of upstream, year-round water from the Provo River by way of newly constructed diversion structures.

20.6 P1-4 **Map 1-1** - Map unfairly shows Rock Ditch but fails to show the Middle or Westside ditches, as if they do not exist. Why?

20.7 P1-10 **Figure 1-1** - Cross Section of the proposed Action fails to show the back-filling of the old channel—ostensibly and practically from material removed from the proposed river channel.

20.8 P1-11 **1.4.2 General** - Where is the mention of public involvement, and why is there little evidence of such involvement in this document?

20.9 P1-14 **Table 1-2 UDNR** - What about the wildlife/game species under the jurisdiction of the state, but not of concern to the FWS?

20.10 P1-15 **1.7 Sentence 7** - If this is so, then why has hardening on outside bends in the lower end of the present proposed reach 8 been used to 'constrain' the river in an area of publicly owned land and enough flood plain width for natural meander as suggested here?

20.11 **1.7.1.1 Paragraphs 4 and 5** - These entire paragraphs are inconsistent with the 'natural' stream concept presented at the outset of this document. Although appropriate for sections of reaches requiring such 'constraints' this approach is entirely inappropriate for those new proposed reaches that would ultimately be left to natural occurrences within the 100-year floodplain boundaries.

20.4 Criteria for establishing reach designations are provided in the PRRP Technical Report (CUWCD 1994), Section 1.4.4. Reach divisions were based on existing physical features, rather than any of the PRRP alternatives (each of which could yield its own reach divisions). The primary benefit of dividing the system into reaches was to assist with organizing information into manageable pieces for discussion and analysis. These divisions do not arbitrarily affect project design characteristics, and would not influence whether or not the plan is "functional." Channel design was performed on a meander-by-meander basis, not a reach-by-reach basis. Changing the reach boundaries at this time would create unnecessary confusion. Accurate analysis and reporting of information rely on the assumption that the reach boundaries remain constant throughout the planning process.

20.5 The side channels and ponds as described would be representative of a wet meadow condition developing in a floodplain containing abandoned channel remnants. It is possible that, as the comment indicates, adjustments in the main channel alignment over long periods of time (e.g., 100 years) could make the side channels or ponds "vulnerable." However, meander migration and other natural processes in an active floodplain would likely work to create backwater ponds, new side channels, and other riverine features which would compensate for (and probably exceed) the benefits provided by designed side channels.

The Proposed Action utilizes abandoned channel sections for wetland mitigation where elevations allow for water to be delivered from the proposed channel. All of the conceptually proposed ponds in Reaches 5, 6 and 8 are located in the abandoned channel. Backwater ponds could easily be created in some of the abandoned channel sections during final design. However, it must be realized that there is an excess of spoil material generated by excavation of the new channel, much of which is currently proposed for disposal in the abandoned channel sections. Using the abandoned channel in ways which would not allow it to be filled would increase the amount of spoil material to be hauled and disposed offsite; this would have impacts on a number of environmental areas (e.g., transportation, energy usage, air quality).

Table 1.1 in Chapter 1 of the Final EIS describes eleven different wetland subtypes that would be integrated into the Proposed Action during final design.

Please refer to comment response 20.2 for a discussion on adding Berkenshaw and Westside Ditches to the Project Area.

20.6 Map 1-1 in the Draft EIS is an overview map, intended only to show the general location of the PRRP Project Area, not specific details. Please refer to Map A-5 in the Draft EIS and Exhibit 4 in Volume 2 of the PRRP Technical Report (CUWCD 1994) for additional details on the Proposed Action. Also please refer to comment response 8.16.

20.7 Please refer to note 5 on Figure 1-1 in the Draft EIS, which indicates that the existing channel can be filled or retained for wetland development. Figure 1-1 has been revised in Chapter 1 of the Final EIS to show a more detailed typical cross-section.

20.8 Please refer to comment response 3.5 and Chapter 4 in the Final EIS.

20.9 Thank you for your comment. Table 1-2 of the Draft EIS lists actions that would be required to authorize the Proposed Action or any alternative. There is no legal action or authorizing action associated with the State of Utah concerning state species of concern. Therefore no revisions were made in the Final EIS

20.10 Additional bank stability measures were proposed in the lower part of Reach 8 to prevent channel meanders from migrating into the USBR constructed Jordanelle Wetlands and damaging constructed wetland cells, water delivery structures, etc. The Proposed Action has been redesigned through Reach 8 (see Map A-1 in the Final EIS). Still the ultimate need for this type of protection will be determined in the final design.

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20.11 Paragraph 4, Section 1.7.1.1 of the Draft EIS describes the low flow channel required to preserve desired depth and velocity conditions during low flow periods. This feature is representative of natural channels which have a sustained baseflow carried within a broader channel area. Over time, river bed conditions will adjust to actual flow characteristics and the somewhat "artificial" low flow channel will become well integrated with the overall bedform.

Paragraph 5, Section 1.7.1.1 of the Draft EIS describes the vortex rock weirs used to stabilize the riffle grades. These features are designed to mimic natural bed features, as described by Dave Rosgen. Over long periods of time the rock material in the vortex rock weirs will become well integrated with the rest of the bed material, and the bed will be capable of adjusting to hydrologic and sediment transport conditions in accordance with the "natural" stream concept referred to in the comment.

The Final EIS has been modified slightly to address the question about the low-flow channel (See Chapter 1, Section 1.5.1.1).

20.12 P1-16 - 1-19 **Table 1-3** - See Map A-5 (enclosed) and the comments relative to that map to compare with this summary of Proposed Action Improvements and other features.

20.13 P1-20 **Table 1-4** - Should reflect 'new' proposed reach designations and the 'new' proposed river alignment which results in a more functional and economical product. Redo this table to reflect these changes.

20.14 P1-21 **Figure 1-2** - A mistake in illustration has resulted in a view from above, which is inconsistent with Cross-Section View A-A.

20.15 P1-22 **1.7.1.1 Paragraph 11** - Again, Map A-5, especially in reaches 7 and 8, does not reflect this philosophy.

Paragraph 12 - The Wilson Diversion under the 'new' proposed alignment is not necessary, although a new smaller diversion would be required at the Wilson Farmhouse to provide for a side channel option for additional year round flow to upper Berkenshaw Creek and irrigation needs in that area.

20.16 P1-23 **1.7.1.2 Paragraph 3, Sentence 5** - This reach does not need a "defined" new river alignment to connect it to upstream and downstream sections as it will have recovered enough on its own by the time restoration efforts reach it to ensure the desired long-term geomorphic stability. Efforts to marry other reaches to Reach 4 should occur in those other reaches. **Leave Reach 4 Alone!**

20.17 **1.7.2.1** - There is no mention in this section of significantly utilizing the old channel to construct at least an equivalent acreage of open water ponds with all of the amenities and characteristics of the proposed ponds. This approach would save considerable money and result in an equivalent product.

Sentence 3 - Berkenshaw Pond is not presently a significant pond as it has completely filled in and is dysfunctional. However, it deserves to be rehabilitated as a valuable resource of the PRRP with the necessary easements, additional flows of the 'new" proposed Berkenshaw Creek side channel option, and 'fish' passage to the excellent spawning habitat potential of the upper Berkenshaw Creek.

20.18 P1-24 **1.7.2.7** - No mention is made of the third obvious type of side channel which includes those side channels (natural or of irrigation purpose) which would greatly benefit from additional year round flows, resulting in significant benefits to the system with considerable savings in development. Berkenshaw Creek (a natural stream) and Westside Ditch 4 (an irrigation ditch predominately developed from a natural water course) are notable options not significantly included in this proposal, and are common sense options not to be overlooked.

20.19 P1-25 **Table 1-5** - Alter the table to reflect the inclusion of Berkenshaw Creek, Westside Ditch 4, and the 'old channel' ponds proposed here.

20.12 Please see comment response 20.47 which provides a detail response to the information which was submitted on Map A-5 of the Draft EIS.

20.13 Please see comment responses 20.4 and 20.47.

20.14 The Commission was unable to identify any mistake in Figure 1-2 in the Draft EIS. Therefore it was not revised in the Final EIS. It appears as Figure 1-4.

20.15 The paragraph noted in the comment refers to a general design philosophy which has been applied in most areas. As the first sentence of the paragraph indicates, there are some locations where any channel migration would not be acceptable due to potential impacts to existing public or private facilities. These are exceptions to the general design philosophy.

20.16 Please refer to comment response 6.9.

20.17 Six of the eight proposed ponds shown on Map A-5 (in the Draft EIS) for the Proposed Action are located within segments of the abandoned channel. Other segments of the abandoned channel are proposed for mitigation of wet meadow and emergent marsh impacts (which would not be satisfied by open water features). As discussed in comment response 20.5, much of the abandoned channel is proposed for excavation spoil disposal to avoid hauling it to offsite disposal sites. Nonetheless, backwater ponds and other open water amenities will be considered for the abandoned channel segments as part of final design.

As noted in the Draft EIS and PRRP Technical Report locations of pond and side channel features is very conceptual at this time, and will require additional analysis and field-checking during final design. The number, location, and layout of ponds could be changed considerably in final design to maximize use of existing features and minimize impacts to surrounding properties as well as project cost.

Berkenshaw Pond is privately owned and is part of a bed and breakfast facility. Therefore the Commission has no plans to improve this pond or include it as part of the restoration project.

20.18 Chapter 3, Section 1.7.2.2, paragraph 3, in the Draft EIS describes the type of side channels to which the comment refers. Several of these existing features have been included in the plan, where they are close to the main channel (e.g., side channel using the Everett Sloughs system on the west side of the channel in Reaches 2 and 3).

Also please refer to comment response 20.2 for a discussion of issues related to Berkenshaw Creek and Westside Ditch.

20.19 Please refer to comment responses 20.2 and 20.47.

1.7.2.2, Paragraph 4, Sentence 1 - Some side channels like the proposed Berkenshaw Creek and Westside Ditch 4 would require a guarantee of year-round flows for fishery and irrigation water rights needs. Such a guarantee may require a manually operated headgate.

20.20 **Paragraph 7** - Under the 'new' proposed action a highly reduced need to outright acquisition is replaced by more economical utilization of already existing side channels where only stream side easements and fencing may be necessary.

P1-26 **Paragraph 7 continued** - Under this 'new' action a greater proportion of the side channels would be outside the public access corridor and would not necessarily require public access to greatly benefit the PRRP through appropriate easements promoting ecologically sound management to increase biodiversity and production of game species.

20.21 **Paragraph 8, Sentence 4** - Why does Table 1-5 exclude side channels created by using existing natural channels and irrigation ditches when they could contribute so much to the PRRP?

1.7.2.4, Sentence 5 - The 'new' Proposed Action would result in a much better balance of excavated material compared to fill requirements.

20.22 **Sentence 6 and 7** - Under the 'new' proposal there are exceptions to these statements where areas could be available for agricultural uses without sacrificing benefits of the Proposed Action of the PRRP.

1.7.2.6, Sentence 3 - Under the 'new' proposal these "islands" of private property could be maintained as they may not influence public access.

20.23 P1-29 **Figure 1-5** - Need another figure similar to this one showing a typical cross-section of the utilization of the old channel on outside bends of the 'new' proposed alignment showing the utilization of existing rock on outside bends and removal of material on inside bends to accomplish project goals while saving on earth moving.

20.24 P1-39 **1.91, Paragraph 1, Sentence 4** - This statement is untrue as the section immediately below the railroad trestle could definitely benefit from an instream structure approach.

Paragraph 2 - Where is the map in the back showing these proposed features? Many of these instream structures are not state-of-the-art and very temporary in nature—Why?

20.25 P1-49 **Figure 1-10** - Why doesn't the Proposed River Channel in the Existing Channel Modification Alternative reflect a more 'natural' cross-section as above?

20.20 Manually operated headgates may be required at some of the side channel diversions, particularly those integrated with remaining irrigation systems. However, one of the project objectives is to minimize use of manually operated controls throughout the system.

It is the policy of the Mitigation Commission to spend public funds only on those features which would be developed on public lands. Spending public funds to create or enhance amenities on private property is outside the project objectives. In addition, the Commission believes public ownership is necessary to adequately protect the resource created. Obtaining only a stream side easement for public access would not be consistent with this policy. It is doubtful that landowners would find it to their benefit to grant a fenced stream side easement for public access along an existing irrigation ditch which bisects their property.

Some changes have been made in the area to be acquired. The Project Area for the Proposed Action is now comprised of a Core Area and an Expanded Restoration Area. Please refer to Section 1.3.2 in Chapter 1 of the Final EIS.

20.21 Please refer to comment responses 20.2 and 20.47.

20.22 The "new" Proposed Action as depicted on the map provided with the comments does not appear to significantly shorten the main channel realignment, which is where most of the excavated material is generated (side channel excavation is a minimal contributor to the excavation volume).

The existing channel alignment would all be acquired under baseline conditions (see Final EIS Section 1.4.1). Thus, the sections of existing channel which would be "abandoned" under the Proposed Action would be in public access under any PRRP alternative,

Concerning the issue of private islands, please refer to comment response 13.10 and Section 1.3.2 in the Final EIS.

20.23 The figure referred to in the comment relates to impacts on the constructed Jordanelle Wetlands, not to generalized channel modification conditions. The comment refers to a condition which will occur in the Proposed Action, particularly in Reach 5. There are a number of special cases like this which have not been depicted in figures in the Draft EIS. The Commission did not feel it necessary to have a figure in the Final EIS to depict each unique situation. However, Figures 1-1 and 1-2 in the Final EIS portray in more detail the typical channel and floodplain features to be created under the Proposed Action and Existing Channel Modification Alternative. In addition, Figure 5-A of the Final EIS depicts the variety of wetland subtypes to be created within the floodplain under the Proposed Action.

20.24 The Draft EIS states that no instream fish habitat structures were proposed for Reach 1. This reach begins at the end of the river levees, which are actually about 1,200 feet downstream of the railroad bridge. The 1,200-ft section between the railroad bridge and the end of the levees is in Reach 2, and would benefit from introduction of fish habitat structures under the Instream Structures Alternative as noted in the comment.

The Commission did not feel it necessary to prepare a map showing locations of all 233 proposed enhancement measures. The reader is referred to the Clearwater Biostudies, Inc. report for this information. As noted in paragraph 2 of Section 1.9.1, Chapter 1 of the Draft EIS, if this alternative is selected additional work would be performed regarding selection of specific fish habitat structures based on current research and experience, and specific locations of habitat enhancement measures.

20.25 The Existing Channel Modification Alternative cross section in Figure 1-10 in the Draft EIS represents a "natural" cross section for a riffle section of a Rosgen B-type (step-pool) channel, which is the predominant channel type in this alternative. The Proposed Action cross section represents a "natural" pool section in a Rosgen C-type (riffle-pool) channel, which is the predominant channel type proposed for the Proposed Action.

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The purpose of Figure 1-10 in the Draft EIS is to depict PRRP property requirements, not provide detail on typical restored channel sections. Figures 1-1 and 1-2 in the Final EIS portray the type of detail your comment addresses.

20.26 P-1-52 **Table 1-11** - This table should be modified to reflect the changes proposed under the 'new' Proposed Action.

P1-55 **Figure 1-11** - This figure should be changed to reflect the changes proposed under the 'new' Proposed Action, especially the removal of Reach 4 from construction consideration (except the renovation of the Berkenshaw Pond and its diversion structure).

P1-57 **Figure 1-12** - Same as for Figure 1-11, above.

20.27 P1-59 **Table 1-12** - This table should reflect the substantial savings generated from the 'new' Proposed Action.

P1-60 **Table 1-13** - Same as above.

P1-61 -1-62 **Table 1-14** - Same as above.

20.28 P1-63 **Table 1-15** - Same as above. What happened to the 'by reach' approach on the Instream Structures section?

20.29 P1-64 **Wildlife Resources** - Very poor paragraph which gives very little sensitivity to wildlife resources in general—come on, we can do better than 'large trees'!

20.30 P2-1 **2.2, Paragraph 1, Bullet 1, Sentence 1** - Except for in Reach 4 where under the 125 cfs minimum flow natural restoration is taking place, as the river is in good unconstrained contact with its flood plain.

20.31 P3-1 **3.1.1.1, Sentence 3** - The reach designations need to be modified, as described herein, before they will truly represent distinctly different river segments in which the Provo River can be divided for planning and environmental purposes.

20.32 P3-2 **Map 3-1** - This map needs to reflect the 'new' proposed more functionally distinct reach designations and the inclusion of both the Middle and Westside Ditches.

20.33 P3-5 **3.2.2, Bullet 2, Paragraph 2** - The proposal being advocated here agrees with these statements and only seeks to mitigate flows removed from Berkenshaw Creek at the diversion structure immediately above the Berkenshaw Creek Pond. This additional year-round flow and the rehabilitation of the diversion structure and Berkenshaw Creek would potentially 'connect' upper Berkenshaw Creek with the Provo River to make valuable spawning habitat for fish available to the Provo River trout populations. Currently, reduced flows make it difficult, if not impossible, for upstream migration of spawners previously utilizing this stretch to make significant contributions to naturally recruited fish.

20.26 Please see comment response 20.47.

20.27 Please see comment response 20.47.

20.28 Please refer to comment response 20.47.

Cost estimates "by reach" for the Instream Structures Alternative were not readily available from the Clearwater Biostudies, Inc. report, and the Commission did not think it was necessary to develop cost estimates by reach..

The costs of the project have been revised. Please see Table 1-17 in the Final EIS.

20.29 This section has been revised in the Final EIS. Please see Section 1.9.6.1 in Chapter 1. Also please see comment responses 13.11 and 13.13.

20.30 Please refer to comment response 6.9.

20.31 Please refer to comment response 20.4.

20.32 Please refer to comment response 20.4.

20.33 Please see comment response 20.2.

20.34 P3-22 **Table 3-7** - Removal of Reach 4 from construction consideration will eliminate the loss of 6 acres of riparian woodland and 6.8 acres of shrub wetland, saving 12.8 acres of impacted wetlands resulting in a 17% improvement.

20.35 P3-23 **Table 3-8** - By the time the project proceeds downstream to Reach 4 most of these numbers will have been accomplished purely by self recovery!

20.36 P3-30 **3.5.5.1.3** - Why is there no corroborative electrofishing data for Baseline Predicted Trout Standing Crop to support the Baseline, Binns HQI Model II?

20.37 P3-47 **3.6.6.3, Sentences 5 and 6** - Is it for these reasons that Reach 4 be left untouched as it is the largest area of existing wildlife habitat along the corridor? **3.6.6.3.1.1, Paragraph 1, Sentences 1, 3, and 4** - Most of the mule deer along the Provo River corridor are concentrated in Reach 4 and would not be affected if this reach were removed from artificial restoration consideration and left to natural restoration.

20.38 P3-48 **Table 3-21, Reach 4** - How can 6 acres of predominantly cottonwood riparian woodland be permanently removed and zero cottonwood trees be removed? Map A-3 shows existing cottonwood forests coming right up to most of the existing present alignment in this reach which has been ground-truthed by us proving it impossible to accomplish the Proposed Action without removing literally hundreds of cottonwood trees.

20.39 **3.6.6.3.1.1, Paragraph 6** - The cottonwoods in Reach 4 do not consist largely of similar aged, mature cottonwood trees because substantial recruitment has occurred (and still continues to occur) as this reach was never diked and the riparian woodland has always interacted with a relatively active floodplain. The periodic inundation and excessive sediment deposition has allowed for incremental recruitment of new trees on almost an annual basis resulting in stands of mixed-age cottonwoods varying in heights and stages of development. This already functional habitat diversity supports the valley's best wildlife populations, which could only be hurt by man's further meddling. (Reach 4 could benefit mostly from the receipt of supplementary flows from the 'new' proposed Berkenshaw Creek and Westside Ditch 4 inclusion , and also from a better transition (connection) to reaches 3 and 5.

Paragraph 7 - Therefore, an unmolested Reach 4 would be utilized by displaced wildlife from construction activities up- and downstream as a refuge to accomplish a no 'down time' scenario for the more mobile wildlife species.

P3-49 **3.6.6.3.1.2** - (see above)

20.40 Cont. **3.6.6.3.2, Bullet 1** - Wildlife sightings will increase for all users, not just landowners! Isn't that the idea?

20.34 Please refer to comment response 6.9.

20.35 Please refer to comment response 6.9.

20.36 Using fish population data directly to estimate baseline predicted trout standing crop is generally considered a less reliable method than the Binns model for the following reasons. Fish populations undergo high year to year variation, which may be independent of physical habitat parameters, whereas models based on habitat availability and quality, such as the Binns model, are not affected by population variations and thus tend to be more robust in their predictions. In any case, regardless of this difference in analysis approach, electro fish data have been reviewed by UDWR and have been found to generally validate the Binns model. Therefore, no change in the Final EIS was required.

20.37 Please refer to comment response 6.9

20.38 The plan for Reach 4 has been modified. Please see comment response 20.16. The sections which the comment refers to have been revised in the Final EIS to reflect the modified plan for Reach 4.

20.39 Please refer to comment responses 6.9, 20.16 and 20.38.

20.40 The discussion under bullet one has been revised in the Final EIS to reflect that wildlife sightings would also increase by visitors to the Project Area.

The Commission was unable to find any problems with the discussion under Section 3.6.6.3.1.1 and no changes were necessary in the Final EIS.

20.40 Cont. **3.6.6.3.1.1, Paragraph 1, Sentence 1** - Hopefully, the distribution of game species will be improved as habitat becomes contiguous along a meandering functional river (as presently exists in Reach 4!).

Sentence 2 - Why is this so? Easements provide for negotiation of mitigated wildlife habitat development.

20.41 P3-50 **Paragraph 3** - Although angler use would increase substantially, it can be predicted that this use will fall off dramatically as the distance from public access points increases. Plus, the difficulty in negotiating some of the areas in parts of Reach 4 will highly confine expected fishermen and other recreational use away from many of the current mule deer fawning and bird nesting areas of this valuable reach.

20.42 **3.6.6.3.3** - Need to re-write and re-think this paragraph because of the significant mistakes made in Table 3-21 and the failure to recognize Reach 4 as the valuable already existing resource, not only for Heber Valley, but also for the PRRP. Too much apparent 'arm-chair-engineering' here and not enough field work.

20.43 P3-60 **3.8.6.2, Paragraph 2** - There may be potential to utilize the former river channel for agriculture in limited cases to mitigate loss of agricultural land in negotiation for wildlife habitat or other project features (see Map A-5, Reach 6 amended alignment/ownership relative to the 'The Island').

20.44 P3-63 **3.9.6.3.2** - Eighteen to 65 percent savings from the adoption of this 'new' proposed river alignment with little loss in benefit, plus the removal of Reach 4 from artificial restoration consideration could total up to significant energy savings in the form of gasoline as outlined herein.

20.45 P3-68 **3.11.6.2, Bullet 3** - (see comments for P3-60)

20.46 B-31 We are concerned that no 'real' standing crop data was taken before the 125 cfs flow was instigated resulting in no potential for before and after comparisons. Since flows have increased below Jordanelle the trout populations have already responded with obvious increases of size and age classes. Would have been good to know! Oh well.

20.41 Thank you for your comment. We agree that distance from access points and limited trail development will help control foot traffic and protect wildlife in the area.

20.42 Please see comment response 6.9, and Table 3-27 in the Final EIS (Table 3-21 in the Draft EIS).

20.43 Thank you for your comment. The existing channel will be within the PRRP Project Area and will be developed for riparian/wetland mitigation.

20.44 Please refer to comment responses 6.9 and 20.47. As stated in 20.47 changes were not made in the Final EIS to reflect the new alignment as proposed in this comment letter.

20.45 Please see comment response 20.43

20.46 Thank you for your comment.

Map A-5, Major Features of the Proposed Action

General Comments - Why aren't both Reach 1 and Reach 10 displayed?

Reach designations should at least distinguish distinctly different reaches by careful placement of their extent separating obvious functional differences. Why don't the designations between Reaches 1 and 2, 2 and 3, 6 and 7, 7 and 8, and 9 and 10 reflect such obvious differences?

Virtually all of the open water ponds and their emergent vegetation zones appear to be mostly arbitrarily placed with little if any consideration for ecology, practicality or economics— Why is this?

Although existing side-channels already exist, very little utilization of them occurs. Rather, placement of most of the proposed side streams appear rather arbitrary, expensive, require additional diversion structures, and fail to utilize already existing features and the old channel—Why?

The proposed action fails to utilize the old channel for backwater and open water ponds—Why is this?

20.47 Cont. The proposed action fails to significantly utilize the old channel for the new river alignment, especially in the more 'constrained' reaches resulting in a much more expensive project where an alignment which is not significantly longer would result in a much less expensive project with as much benefit—Why is this?

Most of these questions relate to the apparent lack of familiarity with 'on the ground' aspects. Before features are placed on map they should be 'ground truthed' to bear out their feasibility—Why weren't they?

Reach 1 - Not Shown - Characterized as the upper end of Deer Creek Reservoir and an extremely straight, channelized stretch at its upper end. It should be restored to maximize fish habitat to 'attach' the river to the reservoir through an 'artificial' effective pool-riffle-pool sequence.

Move the reach designation between Reach 1 and 2 upstream to the Heber Valley Railroad Trestle as the short stretch below the trestle is entirely different from the rest of Reach 2.

Why is there no restoration in the 1,100 feet below the trestle? At least include instream structure to effect the in-channel sinuosity and pool-riffle morphometry.

Reach 2 - Characterized as only one of three reaches fully capable of being restored to a fully functional river. This reach should be allowed to meander naturally after any modifications are completed.

Move the reach between 2 and 3 designation downstream 900 feet to the end of the hardening relating to the relocated Lower Charleston Diversion to separate the 'naturally' functioning stream in Reach 2 from the more 'constrained' nature of Reach 3.

Do not fill in the old channel to create a backwater pond 300 feet above the railroad trestle.

20.47 This comment dealt with a number of suggested changes to the description of the Proposed Action which was presented in the Draft EIS. Attached to the comments was a marked up copy of Map A-5 from the Draft EIS. This map is not reproduced here as part of the comments, but may be inspected at the Mitigation Commission's office.

As detailed in the Draft EIS, the PRRP plans were based on a feasibility level design (see Chapter 1, Section 1.1, Paragraph 6, of the Draft EIS.) As stated in many places in the Draft EIS, changes from the feasibility level design may occur in the final design phase. In many cases the suggestions presented by the comment suggest changes that could be considered in the final design phase of the project. Changes to project design would be based on sound engineering principles, and the latest in river restoration practices available at the time. The portrayal of the Proposed Action and alternatives in the Draft EIS was intended to cover the range of impacts that could occur from implementation of the Proposed Action and its alternatives. Based on the comments received, the Commission believes that the impact analysis was sound and major changes in the Proposed Action and alternatives were not necessary for the Final EIS. Based on the comments, and some additional field work, some minor changes in the Proposed Action and impact analysis has been made in the Final EIS. However, it was not felt necessary to make major changes in the EIS based on the changes suggested in this comment.

This response attempts to provide a detailed response to each of the points raised in the comment. The comment was subdivided into a number of sections with sub-comments under each section. In many cases the comments were duplicates of ones presented for a previous reach, or covered the same general concept. The response deals with each subdivision in a summary fashion instead of each individual comment in the subsection in order to avoid duplication. Responses dealing with a duplicated or similar comment, raised in a previous subsection of comment 47 were not repeated as the response would only be a reference back to a previous subsection discussion.

Several comments prior to this one dealt with changes to various tables, figures, and text necessary to show what the commentor referred to as the new proposed alignment. As stated above, major changes were not made to the Draft EIS as a result of this comment, therefore changes to tables, figures and text as suggested in those prior comments were not made.

General Comments

Reach 1 is not displayed because there are no proposed activities there. There is no Reach 10 in the plan, but assuming this is the reach upstream of Old U.S. 40, it is out of the PRRP study area. However, please refer to the PRRP Technical Report, Section 7.2 (CUWCD 1994), for a brief discussion of this reach and a recommendation that stream enhancement options be considered in final design.

Criteria for siting proposed open water ponds included utilizing the abandoned channel (six of the eight proposed ponds are in the abandoned channel); having an easily manageable way to get water into and out of the pond; integration with proposed or existing side channels; and being within the corridor necessary for the main channel and side channels (Core Area) to avoid the need for additional property acquisition. There are innumerable locations for additional ponds or adjustments to the proposed ponds. The existing Proposed Action shows these features at a conceptual level only; final number, locations, footprints, etc. will be determined in final design, taking into account local topographic features and property ownership issues. Backwater ponds as described in the comments would provide valuable wildlife habitat and may be considered in final design at locations where the new channel crosses the existing channel.

Most of the proposed side channels make use of existing swales, ditches or the abandoned channel. Newly constructed side channels are often proposed to connect the realigned main channel with an existing side channel or pond feature. In addition, most of the existing ditches and swales (channel remnants) have a significantly lower sinuosity than wet meadow-type channels (E-channels in Rosgen's stream classification system); the constructed side channels would provide this very high-sinuosity channel type which is not currently prevalent in the valley due to confinement of the river and agricultural practices.

Eliminate the open water pond at the present 3,000 foot as it is too arbitrary and instead construct a minimum of three ponds along the old channel at and below the Casper Bridge. Significantly backfill the old channel between these ponds.

Eliminate the side stream between 3000 feet and 4300 as it is too expensive and would ultimately get in the way of the naturally meandering course of the main channel in this reach in the future.

Reach 3 - Characterized by the constraints of three diversions, two bridges, private property (including a stream side house), the Wastewater Treatment Plant and an already sinuous, although diked stretch.

Do not fill in a portion of the old channel 300-400 feet below the present Reach 2, 3 designation to leave a backwater pond.

Eliminate the lower end of the existing dike from 2800 to 3250 feet above the present reach designation as it is unnecessary.

What is the inflow at 2700 feet?

Do not fill in a portion of the old channel at 3550 feet to leave a backwater pond.

Change the main channel alignment from 3600 to 6800 to more efficiently utilize the old channel and publicly owned land to realize a 23% savings in earth moving with only an 11% reduction in channel length.

20.47 Cont. Incorporate hardening on the outside bends adjacent to 3600 to 3900 feet, 4100 to 4200 feet, 5100 to 5400, and 5800 to 6000 feet to keep the river in its new sinuous alignment.

Do not fill in a portion of the old channel at the Spring Creek inflow at 4700 feet to leave a flow-through backwater pond.

Incorporate some instream structure in the straight stretch below the Midway Bridge at 6700 to 7500 feet to create a pool/riffle morphometry in an otherwise non-sinuous channel.

Reach 4 - Characterized as the only reach fully capable of self-restoration as it has already proven.

No public ownership along this reach required—instead, effective easements to a permanent 100-year floodplain boundary to accomplish the goals of the project.

Eliminate the arbitrary open water pond and its accompanying side channel as they are not beneficial to this reach, are too expensive, and will ultimately be taken out by the naturally meandering course of the river.

Rehabilitate the diversion structure above the old existing pond on Berkenshaw Creek to allow fish passage.

Reach 5 - Characterized as a reach with only private property constraints which lends it to the potential of full restoration with public ownership if the economics are there.

Change the entire channel alignment in this reach to more efficiently utilize the old channel to realize a 65% savings in earthmoving with only a 15% reduction in channel length.

The proposed main channel in the Proposed Action is integrated with the existing channel alignment and grade to the extent possible throughout the project, The significant increase in sinuosity and meander corridor width makes it impossible to follow the existing channel for very long without violating the PRRP design parameters, which were selected based on comparison with high-quality natural river systems. Any reduction in channel length for the Proposed Action alignment would result in a commensurate reduction in project benefits. Table 1-17 in the Final EIS indicates that the construction cost for the Existing Channel Modification Alternative, which uses the old channel exclusively, is very similar to that for the Proposed Action due to the extensive channel geometry modifications and bed/bank stability treatments required to create desirable habitat conditions along the present alignment.

The Draft EIS and the PRRP Technical Report recognize the fact that the current project description is based on a feasibility-level design, not final design. This included considerable field reconnaissance, analysis of topographic maps and historical information, and comparison with similar natural stream systems. This level of analysis was adequate to define project alternatives and estimate comparative costs, benefits and impacts so that a recommended alternative could be selected. It is anticipated that aspects of the selected PRRP alternative will be modified during final design based on comprehensive field investigations and more detailed topographic mapping.

Also please refer to comment responses 20.4, 20.5, and 20.17.

Reach 1

The Proposed Action includes removing the levees on both sides of the channel downstream of the railroad trestle. This will allow high flows the opportunity to access the floodplain and allow the channel to integrate naturally with the Deer Creek Reservoir backwater area. Placement of instream structures in this reach will not be considered because natural channel adjustments are anticipated after removal of the levees.

Also please refer to comment response 20.24.

Reach 2

The proposed modification for this reach do not vary significantly from the Proposed Action. During final design, project designers could consider most of the recommended modifications suggested here.

Also please refer to comment responses 20.4 and 20.5.

Reach 3

The proposed modifications for this reach do not vary significantly from the Proposed Action. During final design, project designers could consider most of the recommended modifications suggested here.

Under the Proposed Action the existing levee is retained along the east bank of the lower portion of Reach 3 to continue to provide the current level of flood protection to developed private parcels in the floodplain.

This inflow is probably a combination of spring flows and return flows. There is no major tributary at this location.

The normal bank stabilization treatment should be adequate in these sections. Minor meander migration can be tolerated between stations 3500 and 6500.

The Proposed Action includes creating more structural diversity in the channel cross section in the straight section downstream of Midway Road, similar to the modifications described for the Existing Channel Modification Alternative. Please refer to the Draft EIS Section 1.7.1.2, paragraph 2.

Eliminate the arbitrary pond adjacent to the 1000 foot mark on the proposed channel.

Do not fill in the old channel at the 2300 and 4800 foot marks to leave backwater ponds.

Utilize hardening on all outside bends if the final alignment is to be maintained due to private property constraints—otherwise allow river to meander freely within the 100-year floodplain boundary if property can be purchased or adequate easements acquired.

Reach 6 - Characterized by the constraints of three diversions, one major bridge, a sewer line, and private property concerns. However, a considerable public ownership on the upper portion allows for some 'wiggle' in the design and ultimate management.

Move the reach designation between reach 6 and 7 upstream from the Upper River Road Bridge to the end of the setback dike at the present 1000 foot mark in reach 7 to reflect the functional differences between reach 6 and its constraints and reach 7 which should be managed as a functional river between the setback dikes (the 100-year floodplain boundaries).

Change almost the entire channel alignment in this reach to more efficiently utilize the old channel, and private and public land ownership to realize a 32% savings in earthmoving with only an 11% reduction in channel length.

Reconstruct the Probst Diversion upstream 200 feet to fit the new proposed channel alignment.

20.47 Cont.

Eliminate the arbitrary open water pond adjacent to the present 500 foot mark. Fail to backfilll the old channel on its new proposed alignment to provide a backwater pond with its emergent vegetation zone adjacent to the 500 foot mark.

Eliminate the side channel adjacent to the 1500 foot mark as it does not have a diversion or any guarantees of longevity.

Construct a new, larger bridge on the Wilson property to replace the older, smaller one adjacent to the 4500 foot mark on the new proposed alignment.

Renovate the diversion structure at the Wilson farm house to provide a continuous flow which connects to the upstream end of Berkenshaw Creek to provide for a long and significant side stream channel to enhance spawning and recruitment of naturally spawned fish in the system (Berkenshaw has the potential of being **the most significant** contributor of salmonids to the Mid Provo River through natural means.) **Why has this option not been seriously considered hence forth, and where is the data showing its lack of feasibility?**

Eliminate much of the long and somewhat arbitrary side stream channel to the east of Reaches 5 and 6. Instead, utilize the much longer and already established Westside Ditch 4 through appropriate easements to provide a continuous flow which connects back to the main channel through the already existing wetland just above the Midway Bridge at or near the Reach 3, 4 designation. Westside Ditch is already connected to the Wasatch Canal via Rock Ditch requiring no additional diversions below the new proposed relocated Wasatch Canal Diversion. (The Westside Ditch already has the largest, most stable trout population in the Upper Fields below its point of diversion in the floodplain.) **Why has this option not been seriously considered henceforth, and where is the data showing its lack of feasibility?**

Reach 4

Please see comment responses 6.9, 9.1, and 20.17.

Reach 5

The comment recommends channel alignment changes that are greater and would adversely affect flow conditions more than those recommended for any other reach. On average, the commentor's plan reduces sinuosity from 1.4 to 1.1, reduces meander amplitude from 520 ft to 310 ft, and increases the channel slope from 0.007 to 0.009 ft/ft. The resulting increased flow velocity and decreased depth would not be consistent with project goals.

Reach 6

In Reach 6 the comment recommends a new channel alignment that is considerably different from the Proposed Action. Over a 10 meander segment the proposed changes, on average, reduces sinuosity from 1.32 to 1.18, reduces meander amplitude from 420 ft to 300 ft, and increases channel slope from 0.009 to 0.010 ft/ft. These changes would result in less than optimum flow conditions (i.e., increased velocity and decreased depth), and would not be consistent with project goals.

The primary purpose of this side channel is to provide a source of water to the proposed pond. If the pond is relocated, the side channel would be modified or deleted accordingly.

Issues regarding existing or proposed facilities on private property will be worked out with the individual landowners during final design.

Diversions should be located on outside bends to function well during low flow periods.

A diversion will still be required to provide the Wilson water right.

These 1-ft rock drops are needed to make the design channel slope and depth compatible with the existing valley slope and floodplain elevation without generating excessive cut-and-fill requirements. If these drops are required for the Proposed Action alignment, the plan proposed by the commentor will require more of these structures to maintain the desired channel slope because its length is shorter.

The normal bank stabilization treatment should be adequate in these sections, and would allow for only minor meander adjustments over time.

Also, please refer to comment responses 20.2 and 20.5.

Eliminate the arbitrarily situated open water ponds adjacent to the 4200 and 5000 foot marks. Fail to backfill the old channel adjacent to the 4000, 6,000, and 9,300 foot marks to provide for three backwater ponds, complete with their emergent vegetation zones.

Relocate the proposed relocated Gertsch Diversion upstream adjacent to the 5900 foot mark.

Eliminate the now unnecessary Wilson Diversion as the result of the new proposed channel alignment.

Eliminate the other non-specified connections (diversions?) and side channels as they have no potential for longevity as illustrated.

Eliminate the unnecessary drop structures at the 5000 foot mark by utilizing the new proposed channel alignment.

Provide additional hardening along all outside bends, near privately owned structures (the Wilson farm), at bridges (the Upper River Road Bridge), and where the new proposed channel alignment contacts the old channel on outside bends (economics).

Fail to back fill the old channel immediately above the Upper River Road Bridge to provide for a backwater pond complete with its emergent vegetation zone.

20.47 Cont.

Reach 7 - Characterized by mostly public ownership and the obvious potential to restore the river to a fully functional river between the setback dikes (100-year flood plain boundary) with few, if any, constraints upstream to the proposed relocated Wetland Water Supply Pipeline .

Move the reach designation for reach 7, 8 upstream to the proposed relocated Wetland Water Supply Pipeline to reflect the obvious differences between the new proposed Reach 8 with its many constraints requiring a 'fixed' channel alignment, and Reach 7 with few, if any, constraints, lending it to the potential of becoming a fully functional river capable of meandering naturally between the 100-year floodplain boundaries (set back dikes).

Construct a new diversion structure for supplemental flow to the Westside Ditch side stream at either of two outside bends to the east below the River Road Bridge.

Change some of the proposed channel alignment in this reach to affect a more sinuous channel, which would realize an 18% savings in earthmoving with only a 1% reduction in channel length.

Fail to backfill the old channel at the present proposed 1200 foot mark to provide for a backwater pond complete with its emergent vegetation zone.

Fail to backfill the old channel adjacent to the present 3100 foot mark to also provide for a backwater pond which would receive the new proposed side stream in this reach.

Eliminate most of the side streams in this reach in favor of one that primarily utilizes the old channel to save significant money while also passing water through the three new proposed open water ponds, also constructed in the old channel.

Eliminate the somewhat arbitrary proposed open water pond adjacent to the Baum Diversion. Move the setback dike adjacent to the present 3300 foot mark of reach 7 east to the other side of the old channel.

Reach 7

In Reach 7 the Proposed Action channel has been realigned from the Draft EIS to reduce wetland impacts and potential impacts to spotted frogs. The commentor's proposed plan recommends a new channel alignment, but in light of the recent changes, they no longer apply. In addition, the commentor's plan recommends reducing bank protection (riprap) throughout this reach to allow for more dynamic river processes. This recommendation could be considered during the final design phase.

The proposed pond near the Baum Diversion is not practical considering the changes made to the Proposed Action in Reach 7 for the Final EIS. The new main channel would be constructed in a meandering pattern, but generally following the existing river alignment through Reach 7 and Reach 8.
Additional bank stabilization measures are proposed in the upper meander of Reach 7 and the lower part of Reach 8 to prevent the channel/floodplain from encroaching into the constructed Jordanelle Wetlands.

The 100-year floodplain was mapped based on the pre-Jordanelle wetland ground contours, for lack of better available data. When the impacted portion of the wetland cells is removed, the topography will be different than shown, but specifics can not be determined at this time. It is possible that the flood boundary could extend out to the remaining wetland cells after project grading has been completed. (Note: the unusual shape of the remaining Jordanelle wetland boundary opposite station 800 is due to the layout of existing wetland dikes in the constructed wetland complex.)

Extend the setback dike adjacent to the present 1700 foot mark of reach 8 to protect the area to the east from 100-year flood considerations.

Eliminate all of the in-channel hardening on outside bends to allow the river the 'freedom' to meander as a natural fully functional river within the constraints of the 100-year flood setback dikes. **Why is the river being constrained in this reach?**

Why the discrepancy between the 100-year floodplain boundary and the setback dike adjacent to the present 300 foot mark in reach 8?

Relocate the Baum Diversion upstream to just below Highway 40.

Reach 8 - Characterized by numerous constraints including a private bridge, the Highway 40 bridge, the Wetland Water Supply Pipeline, a buried grade control structure, and four diversion structures; this reach's ultimate alignment will need to be maintained to prevent significant movement.

Move the reach designation between reach 8 and 9 upstream to the private bridge at the present 1,600 foot mark in Reach 9 to reflect the significant functional differences between these two reaches, as reach 8 is highly constrained by numerous immobile features and reach 9 which is only constrained by the existing Mitigation Wetlands and could be managed as a fully functional meandering river.

Where is the diversion for the proposed side stream originating at the buried grade control structure at the 3,150 foot mark of the proposed reach 8?

20.47 Cont.

Make a slight modification in the channel alignment from the 3600 foot mark of reach 8 to the 600 foot mark of reach 9 to more efficiently utilize the old channel to realize a 62% savings in earth moving with only a 4% reduction in channel length.

Eliminate the open water pond above the Highway 40 Bridge.

Fail to backfill the old channel adjacent to the 3800, 4800, and 5600 foot marks of the present reach 8 and the 500 foot mark of reach 9 to create four backwater ponds complete with their emergent vegetation zones.

Relocate the relocated Wasatch Diversion to correspond to the new proposed channel alignment.

Where is the diversion structure for the proposed side stream originating at the 5250 foot mark in reach 8?

Harden all outside bends with diversion structures, adjacent to bridges or to maintain the ultimate alignment.

Reach 9 - Characterized by exclusive public ownership and constrained only by the setback dikes protecting the Mitigation Wetland Ponds lending it as the most valuable reach for full restoration to a fully functional, meandering river within the 100-year floodplain boundaries.

Eliminate all side streams in this reach as no diversion structures were proposed and meanderings of the fully restored river would eventually eliminate them anyway.

Fail to backfill the old channel at the 2100, 3600, 5100, 6800 foot marks to create backwater ponds complete with their upstream emergent vegetation zones.

Extend the setback dike downstream to the private bridge abutment on the east side of the river adjacent to the 2000 foot mark to protect the bridge.

Reach 8

The comment recommends modifying the Draft EIS proposed river channel alignment. Considering the changes made to the main channel alignment in the Final EIS through Reach 8, these recommendations no longer apply. Most of the types of modifications could be considered in the final design for their applicability to the new channel alignment.

Diversion structures to proposed side channels have not been shown on the maps (unless they are located at existing points of diversion), but are implied. The Draft EIS, Section 1.7.2.2, paragraph 4, describes options for passive diversion features for side channels.

The normal bank stabilization treatment should be adequate except where special treatment is called for on the maps, and would allow for only minor meander adjustments within the river corridor over time, except for the channel segments upstream from the Baum Diversion.

Reach 9

The comment proposes the addition of backwater ponds, and modification of pond and side channel locations. The restoration design team realizes that these features would provide needed habitat for wildlife, and they could consider this proposal during the final design. Additionally, the Proposed Action plan illustrates pond features and side channels that are conceptual in nature and may be significantly modified in the final design.

The function of the proposed setback dike ending near station 2000 is to protect the constructed Jordanelle wetlands cells which would be modified by the Proposed Action. It terminates at the end of the wetland cells. The existing private bridge should be adequately protected by standard abutment treatments (e.g., riprap - see the Draft EIS Section 1.7.1.1, last paragraph). Extending the setback dike to the bridge abutment would unnecessarily constrict the floodplain to a width of less than 150 feet, significantly reducing project benefits in an area where there are no private ownership constraints.

Also please refer to comment response 20.5.

United States Department of the Interior

U.S. GEOLOGICAL SURVEY
Reston, Virginia 22092

In Reply Refer To:
Mail Stop 423

AUG 1 2 1996

MEMORANDUM

To: Project Manager, Central Utah Water Conservancy District
Executive Director, Utah Reclamation Mitigation and Conservation Commission

From: James F. Devine
Senior Advisor for Science Applications

Subject: Review of Draft Environmental Impact Statement for the Proposed Wasatch County Water Efficiency Project and Daniel Replacement Project, and the Proposed Provo River Restoration Project, Wasatch County, Utah

Per the request contained in the Central Utah Water Conservancy District's memorandum of June 10, 1996, the U.S. Geological Survey (USGS) has reviewed the subject draft environmental impact statement and offers the following comments:

Wasatch County Water Efficiency Project and Daniel Replacement Project

Daniels Creek, above Diversions:

Section 3.2.5.4.1.1, Page W 3-17

The value of 2 cubic feet per second (cfs) used as the natural winter flow at the USGS gage on this stream should be changed to approximately 3 cfs for the November through February periods.

Impact Analysis:

Section 3.2.6

The affects on canals that provide flood control in Heber Valley should be discussed in the final environmental impact statement.

Section 3.4.6

The source of water for restoration of wetlands should be further discussed in the impact section.

The proposed project will yield a net increase in wetland area in the project area, but will result in a loss of 2.1 acres of riparian woodland. Some discussion of relative values of the various types of wetlands may be appropriate to determine if this loss is acceptable.

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Karen M. Ricks; Michael C. Weland 2

Provo River Restoration Project

Water Resources:

Section 3.2

21.1 There would be an increase in travel time between Jordanelle and Deer Creek Reservoirs. Small groundwater changes in the northern part of the valley, adjacent to the river, could occur.

Temperature:

Section 3.3.6.3.1.2, Page P 3-12

21.2 There is an apparent contradiction between the first and second paragraphs of this section. The first paragraph, and accompanying table, state that temperature changes from 1.2°F to 6.2°F are expected in individual reaches. The second paragraph states that "temperature increases in the river are less than 0.3°F using worst-case mixing and dilution calculations." One of these conclusions must be incorrect and should be deleted.

Copy to: USGS State Representative, Water Resources Division, Utah
Director, Office of Environmental Policy and Compliance

Responses to Comment Letter No. 21

21.1 Thank you for your comment. Sections 3.2.6.3 and 3.2.6.3.2 in the Draft EIS confirm your statements.

21.2 The text of Section 3.3.6.3.2 has been revised in the Final EIS to indicate that under worse-case conditions, the influence of side channel flows entering the main Provo River channel would be no more than a 0.3 ^{0}F increase.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE
LINCOLN PLAZA
145 EAST 1300 SOUTH, SUITE 404
SALT LAKE CITY, UTAH 84115

In Reply Refer To
(CO/KS/NE/UT)

August 23, 1996

Mr. Michael C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
c/o Central Utah Water Conservancy District
355 West 1300 South
Orem, Utah 84058

Dear Mr. Weland:

This is in response to a joint request from you and Ms. Karen M. Ricks, Project Manager, Wasatch County Water Efficiency Project (WCWEP), Central Utah Water Conservancy District (CUWCD) dated June 10, 1996 for comments on Draft Environmental Impact Statements (DEIS) on the proposed WCWEP and the Provo River Restoration Project (PRRP). This letter contains the Fish and Wildlife Service's (Service's) comments on the PRRP DEIS. We are providing comments on the WCWEP DEIS by separate correspondence addressed to Ms. Ricks.

GENERAL COMMENTS:

The Service and other involved conservation and land management agencies have worked closely with the Utah Reclamation Mitigation and Conservation Commission (URMCC) and the Central Utah Water Conservancy District (CUWCD) throughout the process of developing plans for the PRRP and WCWEP. Early in the planning process, basic plans were reviewed by involved agencies, proposed procedures for evaluating impacts to fish and wildlife habitats were reviewed by the Service and the other involved parties, and we were afforded opportunities to review results of the analysis and offer suggestions for modifications to protect environmental resource values. In general the Service concurs in the analyses presented in the PRRP DEIS.

The DEIS presents three action alternatives and a no action alternative. The action alternatives are designated the Proposed Action (Riverine Habitat Restoration), the Existing Channel Alternative, and the Instream Structure Alternative.

The Proposed Action (Riverine Habitat Restoration) would result in a realignment of a majority of the existing Provo River channel and floodplain system between Jordanelle Dam and Deer Creek Reservoir. Designs are for a meandering riffle-pool sequence to recreate a naturally functioning system that is in dynamic equilibrium with current valley and hydrologic conditions. Levees would be removed where 100-year flood protection can be

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achieved by the expanded floodplain or a setback levee. A meandering riffle-pool channel interacting with a functioning floodplain would be developed where possible. In some reaches the existing channel would continue to be used and in others the present channel would be abandoned and a new alignment would be developed. Where possible, the river channel would be allowed to migrate within a designated corridor in response to changing hydrologic and geomorphic factors.

With the PRRP/Proposed Action, side channels and ponds would be developed adjacent to the new river alignment throughout the Provo River corridor between Jordanelle Dam and Deer Creek Reservoir. The side channels would be small meandering streams that would convey the flows through the adjacent stream and pond system and then back into the main river channel. Areas disturbed by construction would be revegetated with appropriate plants.

With the PRRP/Existing Channel Alternative the cross section geometry of the present channel alignment would be modified to create a functional step-pool or rapid-pool system by the use of rock weirs and large boulders. Areas that are disturbed by construction would be revegetated with appropriate plants.

With the PRRP/Instream Structure Alternative only minor changes would be made to the existing channel geomorphology and elevation. Fish habitat improvement structures would be installed at selected locations.

With the No Action Alternative there would be no changes except those that are described as baseline conditions, that will be present during the future with-or-without this proposed project. These baseline conditions include implementation of environmental commitments included in the Bureau of Reclamation's 1987 Final Supplement to the Final Environmental Impact Statement for the Municipal and Industrial (M&I) System that were included in the Central Utah Project Bonneville Unit-Utah Supplement to Definite Plan Report, dated June, 1983 and revised September, 1984. Baseline conditions also include stream fisheries habitat improvements on the Provo River, that were recommended in the Aquatic Mitigation Plan for the Strawberry Aqueduct and Collection System. This mitigation plan was prepared by the Interagency Biological Assessment Team and issued by the Service under authority of the Fish and Wildlife Coordination Act on December 13, 1988.

22.1 The Service has several concerns about potential impacts to the federally listed threatened bald eagle and Ute ladies'-tresses orchid and the spotted frog, which is a candidate species, but is optimistic that appropriate conservation measures can be incorporated into project plans to avoid jeopardy. Overall, the Service is supportive of the Preferred Action (Riverine Habitat Restoration).

22.2 The Instream Structures Alternative would help meet requirements for mitigation of stream fisheries habitat proposed in Aquatic Mitigation Plans for the Strawberry Aqueduct and Collection System, but recent studies lead us to believe that some of the proposed structures may not be cost effective and we believe a reevaluation of the benefits associated with this alternative is warranted.

Responses to Comment Letter No. 22

22.1 Conservation measures as well as project features will be implemented to avoid jeopardy to federally listed or candidate species. Ongoing coordination with the Fish and Wildlife Service will be maintained throughout project implementation.

22.2 We have reviewed the recent report prepared by Bio/West, Inc. for the Mitigation Commission (Mitigation Commission 1995) assessing the Stream Habitat Improvement projects implemented as partial mitigation for CUP impacts from the Strawberry Aqueduct and Collection System. We concur that some of the structures identified for the Instream Structures Alternative might be revised during final design review, if that alternative is selected.

There are only a few trout fishing streams in Utah that are similar in quality to the Provo River downstream from Deer Creek Reservoir. The Proposed Action would provide a similar quality "blue-ribbon" trout fishery on 12.27 miles of the Provo River between Jordanelle and Deer Creek reservoirs to meet increasing demands for angling opportunities. However, the potential value of the project in terms of providing riparian wildlife habitat enhancement is somewhat masked and overshadowed by emphasis on the loss of 1,216 mature cottonwood trees. Unlike protected species of wildlife, riparian habitat is not afforded legal protection, but overall it is a highly productive habitat type and is a rapidly disappearing resource.

Riparian systems are the interface between aquatic and upland ecosystems and are characterized by distinct vegetation and fauna, high productivity, and high densities and diversity of wildlife species (Mitsh and Gosselink 1986). Historically the Provo River floodplain riparian system extended over a width of 1,000 feet or more with multiple channels and supported a rich array of aquatic and terrestrial wildlife and native plant communities. During the last 100 years however, human activities have dramatically altered the watershed's hydrology and ecosystem. A desperate water shortage was experienced in Salt Lake City during the 1930's which prompted requests for Government assistance in obtaining a dependable water supply for Salt Lake Valley, and approval of the Provo River Project followed. Construction of the Provo River Project began in May 1938, and water became available from storage in Deer Creek Reservoir in 1941. Subsequently, the Duchesne Tunnel, another feature of the Provo River Project, was completed to import water from the North Fork Duchesne River. Importation amounts via the Duchesne Tunnel have varied over the years from a minimum of about 230,000 in 1942 to a maximum of about 427,639 acre-feet in 1952, and average about 265,900 acre-feet. Water is also imported from the Weber River via the Weber-Provo Diversion Canal, another feature of the Provo River Project. Also, agricultural interests constructed reservoirs in the headwater area; numerous diversions on the Provo River provide irrigation water in the Francis-Kamas area; several diversions between Jordanelle and Deer Creek provide water for irrigating Heber Valley; and there are more than a dozen diversions downstream from Deer Creek Reservoir, the major ones being Salt Lake and Union aqueducts and the Provo Reservoir Canal. The channel has been realigned in numerous places in the process of building roads, dikes to control flooding and to facilitate more intensive agriculture, and other measures to permit greater urbanization. These changes were important in development of the local economy and were implemented during times that natural streams and their associated riparian ecosystems were abundant.

Our once abundant high quality fishing streams and riparian ecosystems are now in rather short supply regionally and nationwide. Riparian ecosystems in the intermountain west have a wide variety of plant communities because of elevational, geomorphic, and climatic influences (Brinson et al. 1981; Johnston and Lowe 1985). Attributes that augment the diversity of wildlife species and productivity of riparian communities include a predominance of woody plant species, high soil moisture and surface water, diversity and interspersion of

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physical features of habitat and plant communities, and corridors that facilitate animal dispersal and migration (Brinson et al. 1981).

Because of their unique attributes and relative rarity and the delineating diversity of their flora and fauna, riparian communities have been recognized on a regional and national level (Johnson and Carothers 1982; Szaro and Rinne 1988; Flather and Hoekstra 1989). More than 70% of the riparian areas in the United States have been altered (Brinson et al. 1981), and the average annual loss of forested wetlands in the Rocky Mountain states is about 1% (Cooper and Lee 1987).

Riparian areas in the Southwest have become reduced by greater than 80% compared to historic conditions. Although they comprise less than 2% of the total surface area they provide vital habitat to many plant and animal species (Rinne 1993). Well developed stands of riparian vegetation provide both direct and indirect cover for fish. Overhanging branches provide direct cover, while the shade from tall plants provide indirect cover, since the fish are camouflaged by shaded waters. Streamside vegetation is also important in regulating stream water temperatures by filtering solar energy and providing lower temperatures, which are required by most species of salmonids. As root masses become developed, stream banks are stabilized which allows for moderate underbank cutting, which in turn provides resting and hiding cover for fish. Leaves and woody materials also provide habitat for microinvertebrate fish food organisms.

Riparian zones provide habitat for 50 to 75% of vertebrate species found in the western intermontane region, and they are especially important to neotropical migratory birds where riparian areas are scattered amidst great expanses of arid land (Secretary of the Interior 1994). Approximately 45% of Utah's neotropical migrant birds use riparian zones during the breeding season, an additional 30% use riparian zones during migration, and about 67% of all Utah bird species use riparian zones sometime during the year (F. Howe, Avian Biologist, Utah Division of Wildlife Resources, personal communications. 1995). Other important functions of riparian habitats include:

- Slowing flood waters and helping to recharge groundwater;
- Aiding in erosion control through shoreline protection, dissipating the energy force of currents and trapping sediments;
- Improving water quality by filtering pollutants from upland sources and by regulating water temperature through vegetational shading.
- Serving as important recreational areas.

Nationwide, 60 to 75 percent of riparian wetlands have been converted to other uses, whereas there have been declines on the order of 90 to 95 percent in the West. Surveys of

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riparian areas remaining within Western public rangelands indicate that most are not in healthy, fully functional condition (Secretary of the Interior 1994).

Public attitudes regarding the urgency and need to enhance and protect high quality stream fisheries and riparian resources has changed over the years. There is increasing awareness of these needs, and the policies of state and federal fish and wildlife and land management agencies have changed in response to public demands. The Service places a high priority on measures that will restore and enhance these values.

22.3 The Proposed Action Alternative offers a unique opportunity to mitigate unmitigated losses of fish and wildlife habitats associated with various Bonneville Unit, Central Utah Project features and the Provo River Project.

The DEIS incorporates a number of Standard Operating Procedures (SOPs) to avoid, minimize or rectify adverse impacts on natural resources, elements to mitigate unavoidable environmental damages, and conservation measures to avoid impacts to endangered, threatened, and candidate species. Our specific comments, which follow, suggest some modifications in these commitments to protect environmental resources.

22.4 Some previous documents that we have reviewed on other federal water development projects to meet National Environmental Policy Act compliance needs have collectively referred to such measures as "Environmental Commitments" and included a list of these measures in the Appendix. A number of commitments that will protect environmental resources are appropriately incorporated in different sections of the document under review. We believe a list of all of the environmental commitments would aid reviewers in understanding overall plans for avoiding losses to the extent practicable and mitigating unavoidable impacts. We recommend that such a list be included in the Appendix.

SPECIFIC COMMENTS:

The same numerical designations used in the DEIS are used as reference here followed by paragraph numbers in parenthesis ( ).

22.5 1.11.7 (2) Here it is mentioned that SOPs listed in Section 1.12.9 of Chapter 1 of The WCWEP and DRP DEIS are pertinent to the PRRP as well and are incorporated by reference. A similar statement is also made in 3.1 (3).

We have attempted to incorporate most of the ECs pertinent to the PRRP in this letter; however, you are also referred to our comments about ECs on the WCWEP DEIS. One EC for the use of fabric overlays to minimize damage to adjacent wetland vegetation during the construction of pipelines has been deleted from this list because it is not pertinent to the PRRP.

22.3 Thank you for your comment. We will consider your comment in the decision-making process.

22.4 A list of “Environmental Commitments” has been added to the Final EIS as Appendix D.

22.5 Chapter 1, Section 1.9.6.1 of the Final EIS contains a complete list of SOPs for the PRRP. Also please see comment response 22.04.

The 125 cfs minimum streamflow was a commitment included in the M&I System EISs, and Sec. 303 (c)(2) of the CUPCA specifies that this minimum streamflow is to be provided continuously and in perpetuity from the date first feasible. It is further stated that the date when this becomes feasible shall be determined by the URMCC in consultation with the Service, and the Utah Division of Wildlife Resources (UDWR).

22.6

Jordanelle Reservoir became operational on July 9, 1996, and we believe that it is appropriate to maintain the intended 125 cfs between Jordanelle and Deer Creek reservoirs, but that consideration should be given to the potential need for reducing the flow if necessary to facilitate construction of the three action alternatives under consideration for this project or for reconstructing existing diversion facilities.

ECs that the Service suggested from information in Chapter 1 of the WCWEP DEIS and the above discussion are as follows:

- Topsoil to a depth of one foot (or less if topsoil layer is less than one foot deep) shall be removed in the process of constructing any features and stockpiled for site restoration.
- As may be needed for revegetating disturbed sites, additional topsoil of suitable quality shall be secured from areas that will have minimal impacts on important fish and wildlife habitats.

22.7 Cont.

- Scrap materials shall be removed from work sites after construction is completed.
- Construction of pipeline crossings in stream channels will be scheduled during low flow periods.
- The URMCC in consultation with the Service and UDWR shall determine the earliest date that minimum stream flows of 125 cfs can be maintained in perpetuity between Jordanelle Dam and Deer Creek Reservoir.
- Any existing river diversion facilities located between Jordanelle and Deer Creek reservoirs that are incapable of allowing a minimum of 125 cfs to pass at all times shall be reconstructed to function properly at that flow.
- Designs for river diversion structures shall include features to screen all intakes and facilitate fish migration (fish ladders). Such designs shall be

22.6 The instream flow commitment of 125 cfs has been met continuously since July 9, 1996 when Jordanelle Dam filled and was declared operational. The Mitigation Commission will coordinate with U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, Utah Division of Wildlife Resources, Central Utah Water Conservancy District, and other affected and involved parties regarding any requests to reduce flows in Provo River to accommodate construction needs. The Final EIS has been modified to reflect the provision of the 125 cfs minimum flow.

22.7 Thank you for the recommended environmental commitments. All of the PRRP-related environmental commitments suggested have been included in Appendix D of the Final EIS, except as subsequently modified by mutual agreement in the Fish and Wildlife Coordination Act Planning Aid Letter.

22.7 Cont.

developed in cooperation with the Service and Utah Division of Wildlife Resources.[1]

- The URMCC will construct seven new fishing access points along the Provo River between Jordanelle and Deer Creek reservoirs, acquire and fence land along the Provo River to provide contiguous fishing access (by foot only), and construct parking areas and sanitary facilities. Specific plans for the access points and appurtenant facilities shall be developed in cooperation with the Service and UDWR in the interest of avoiding and protecting sensitive fish and wildlife habitats and native plant communities.

- As appropriate, the floodplain shall be fenced so that cattle grazing can be managed to increase the chance for the regrowth of cottonwood trees.[2]

- Care will be taken to avoid the escapement of wet concrete into water ways and other sensitive fish and wildlife habitats.

- Concrete batch plants will be situated in specific areas away from waterways and sensitive fish and wildlife habitats.

- Concrete trucks and equipment shall be washed only in specifically designated areas, which will not impact streams or sensitive fish and wildlife habitats.

- Disturbed areas shall be reclaimed and returned to pre-existing or enhanced fish and wildlife habitats as soon as possible after construction.

- Site analysis shall be conducted on areas where there is a potential erosion problem, to determine appropriate procedures that are needed (i.e., soil stabilizing materials, seeding mixtures, and mulching and fertilizing treatments).

- Plant species for rehabilitating disturbed areas and for erosion control shall be selected on the basis of soil type, root stabilizing characteristics, consistency with composition of contiguous native plant communities, compatibility with

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[1] This commitment is not included in the DEIS.

[2] The Service's draft Biological Opinion on the PRRP includes fencing as a term and condition to reduce the length of time required for the reestablishment of mature cottonwood trees. It is important to understand that young cottonwood trees and cottonwood leaves are extremely palatable to livestock. Exclusion of livestock for at least 15 to 20 years may be necessary for the successful reestablishment of cottonwood trees. Project plans described in 3.3.6.3.1.1 of the DEIS state that in addition to lands required under baseline conditions, 169.5 acres of other agricultural lands will be acquired and fenced to exclude livestock. From the fish and wildlife perspective, exclusion of livestock from as much of the project lands as possible would be desirable except in cases where it is determined that grazing would be an appropriate vegetation management tool.

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wildlife, and ability to compete with undesirable vegetation. Appropriate revegetation plans shall be developed in cooperation with the Natural Resources Conservation Service (NRCS), Service, and UDWR. Planting, watering and fertilizer applications will be on schedules that are optimal for the species selected.

- Monitoring to assure the success of revegetation and erosion control efforts shall continue for a period of at least 3 years, and longer if anticipated results have not been achieved.

- To the extent feasible, heavy equipment will not be used in stream beds and riparian areas. If heavy equipment must be used, seasonal timing, equipment and techniques that will minimize impacts shall be employed

- Toxic materials will be properly handled, stored, used, and disposed of in a safe manner.

22.7 Cont.

- Silt fences will be erected and maintained during the construction period to reduce the potential for impacts to wetlands.

- Construction barriers shall be installed to prevent unnecessary construction damage to adjacent wetlands.

- Impervious barriers shall be installed where needed to prevent the drainage of wetlands by trench and pipeline construction.

- Materials excavated in the construction of pipeline trenches shall not be deposited on wetland or sensitive plant or wildlife habitat areas; this material shall be stored on adjacent roadways or in other upland areas to be used later in refilling the excavation.

- After wetland topsoils are replaced, the disturbed area will be graded to contour levels that blend with adjacent lands, and revegetated with a mixture of desirable native wetland plant species.

- A wetland monitoring plan shall be developed in cooperation with the Corps, U.S. Forest Service, NRCS, UDWR, and the Service, and periodically these agencies shall be afforded opportunities to review monitoring records, amend the plan as may be appropriate, and offer recommendations in the interest of preserving and enhancing natural resource values.

- To the extent feasible, construction that causes increases in water turbidity shall avoid the brown trout spawning and egg incubation period (October-March).

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22.7 Cont.

- To the extent feasible, ROWs for project features will be aligned to minimize the loss of large trees, sensitive fish and wildlife habitats, and unique plant communities.

- To the extent feasible, construction in vicinity of such sensitive habitats as deer fawning areas will be scheduled during times when disturbance impacts will be avoided. (Typically deer fawning occurs during June-July.)

- Future land uses in ROWs will exclude the replacement of buildings removed during construction and any uses that impair water quality.

22.8 3.1.2 (2) Comments on baseline conditions for the PRRP in regards to the Final Supplement to the Final Environmental Impact Statement for the M&I System are the same as the conditions described in the WCWEP DEIS. Our comments on 1.11 (3) of the WCWEP DEIS addressed these baseline conditions. We believe that some modification in the first bullet, which was a commitment contained in the M&I System EISs, may be necessary because of verbiage in Sec. 303(c)(2) which states that the URMCC in consultation with the Service and UDWR shall determine the date that minimum streamflows of 125 cfs can be feasibly maintained, continuously and in perpetuity, between Jordanelle and Deer Creek reservoirs[3]. The third bullet describing commitments contained in M&I System EISs is erroneous in that fencing of the new angler access along the Provo River was not required by these commitments. The Service however believes fencing of the floodplain to allow management of cattle grazing and increase the chance of regrowth of cottonwood trees that are used for perching by the bald eagle is essential and intends to include fencing as a reasonable and prudent alternative for reducing take of bald eagles in their BO on the PRRP. Inclusion of fencing is therefore necessary although not a commitment of the M&I EISs. With this exception, we believe including the first three bullets presented here as ECs would be appropriate.

22.9 Cont.

The following ECs are suggested for consideration:

- Any existing river diversion facilities located between Jordanelle and Deer Creek reservoirs that are incapable of allowing a minimum of 125 cfs to pass at all times shall be reconstructed to function properly at that flow.[4]

- Designs for river diversion structures shall include features to screen all intakes and facilitate fish migration (fish ladders). Such designs shall be

[3] See previous discussion on 1.11.7 (2).

[4] This EC was presented previously (See comments on 1.11.7(2)).

22.8 The description of baseline commitments (Chapter 1, Section 1.2.1, paragraph 4 of the Draft EIS) has been revised to indicate that the 125 cfs instream flow baseline commitment has been implemented. Also please refer to Chapter 1, Section 1.4.1 of the Final EIS which describes implementation of baseline commitments.

The second part of your comment suggesting that fencing of the public access corridor was not a required commitment of the M&I System EIS is incorrect. Please refer to comment response 9.8.

22.9 Please refer to comment letter response 22.07.

22.9 Cont.

developed in cooperation with the Service and Utah Division of Wildlife Resources.[5]

- The URMCC will construct seven new fishing access points along the Provo River between Jordanelle and Deer Creek reservoirs, acquire and fence land along the Provo River to provide contiguous fishing access (by foot only), and construct parking areas and sanitary facilities. Specific plans for the access points and appurtenant facilities shall be developed in cooperation with the Service and UDWR in the interest of avoiding and protecting sensitive fish and wildlife habitats and native plant communities.[6]

- As appropriate, the floodplain shall be fenced so that cattle grazing can be managed to increase the chance for the regrowth of cottonwood trees.[7]

3.2.5 (1) - It is stated that future baseline conditions in the Provo River area of the project would be the same as those described in Chapter 3 of the WCWEP and DRP EIS.

It is stated in the WCWEP DEIS that minimum stream flows of 75 cfs in the Provo River below the Olmsted Diversion to Utah Lake as required in Section 303(c)(3) and (4) of the Central Utah Project Completion Act (CUPCA) were not considered in defining the baseline conditions for this EIS because sources to provide this water have not yet been identified.

Sec. 303(c) of CUPCA specifies that after water rights in the Provo Drainage are acquired that the URMCC in consultation with the Service and UDWR shall determine when the minimum streamflow of 75 cfs can feasibly be maintained in perpetuity between Olmsted Diversion and Utah Lake.

The Service has issued a BO concerning the operation of Reclamation's Provo River Project, which requires the annual delivery of minimum flows of 25 cfs in the lower Provo River for flushing, spawning and nursery habitat for the June sucker. This BO included a reasonable and prudent alternative to refine the flow recommendation on the basis of a three-year study.

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[5] This commitment is not included in the DEIS.

[6] This EC was presented previously (See comments on 1.11.7 (2)).

[7] The Service's draft Biological Opinion on the PRRP includes fencing as a term and condition to reduce the length of time required for the reestablishment of mature cottonwood trees. It is important to understand that young cottonwood trees and cottonwood leaves are extremely palatable to livestock. Exclusion of livestock for at least 15 to 20 years may be necessary for the successful reestablishment of cottonwood trees. Project plans described in 3.3.6.3.1.1 of the DEIS state that in addition to lands required under baseline conditions, 169.5 acres of other agricultural lands will be acquired and fenced to exclude livestock. From the fish and wildlife perspective, exclusion of livestock from as much of the project lands as possible would be desirable except in cases where it is determined that grazing would be an appropriate vegetation management tool.

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At the end of the three year study period, the Service will determine the permanent block of water to be acquired and delivered for June sucker needs.

22.10 In the WCWEP DEIS, 3.2.6.3.2 (11) mentions that the URMCC in consultation with the Service will decide where to utilize the increased Strawberry Reservoir inflow for enhancement in Uinta Basin streams.

Sec. 303(b)(1)(C) of the CUPCA states that the URMCC is to consult with both the Service and UDWR.

3.3.5.1 (1) - Statements contained here indicating that the existing riparian ecosystem is not in a good healthy condition are consistent with a previously cited statement by the Secretary of the Interior that most riparian systems today are not in a healthy and fully functional condition.

22.11 3.4.6.2 (1) and (2) - It is mentioned that about 37.6 acres of riparian woodland and 1,080 mature cottonwood trees would be eliminated with construction of the Existing Channel Modification Alternative; and that ultimately 141.9 acres of riparian woodland habitat would be created through natural colonization.

The Service prefers the Proposed Action Alternative over the Existing Channel Modification Alternative because removal of the dikes and restoration of the river to a more natural ecosystem will provide far better riparian wildlife and stream fisheries habitats. We believe there should be mention of the percentage of cottonwood tree loss that the 1,080 mature trees represents.

22.12 3.4.6.3.1 (1) - A paraphrased EC that is mentioned here is as follows:

- Impacts from sediment and water turbidity during construction shall be ameliorated by the use of sediment detention ponds, scheduling construction during dry periods, and development of a sequential construction schedule.

3.4.6.3.3 (1) and (2) - Here, it is mentioned that 9.7 acres of riparian woodlands and 1,216 mature cottonwood trees that will require 15 to 30 years to replace will be lost as a result of the Proposed Action Alternative. Ultimately however, 256.5 acres of riparian woodlands are expected to be established naturally along the banks of the new river. It is also mentioned that natural cottonwood regeneration is expected.

22.13 Cont. Unfortunately, we believe that readers will be unfavorably impressed with the thought of losing a large number of mature cottonwood trees that can not be brought back to pre-project condition for 15 to 30 years. Mention of the total number of the mature cottonwood trees that there are in the project area and what the percentage of loss that the 1,216 mature trees represents may be helpful to readers in understanding the overall advantages and disadvantages of the project. These mature trees are old and will eventually die. The

22.10 The comment applies to the Wasatch County Water Efficiency Project and Daniel Replacement Project EIS, which has been finalized as a separate document from this PRRP EIS.

22.11 Construction of the Existing Channel Enhancement Alternative would permanently remove 40.2 acres of riparian woodlands and shrub wetlands. This represents approximately 11% of the existing riparian woody vegetation in the Project Area.

Thank you for your comment expressing preference for the Proposed Action over the Existing Channel Modification Alternative. Your input will be considered in the decision making process.

22.12 Induced water turbidity will be negligible compared to baseline levels. This turbidity will be minimized by 1) controlling introduction of water into newly constructed channel segments; 2) diluting the small quantity of turbid water with main channel flows; 3) using cobble rock to armor the constructed channel bed to reduce scour of fine sediments.

22.13 Thank you for your comment regarding the relative impact of the Proposed Action on trees. About 316 acres of riparian woodland currently exist within the project area of influence. About 13.3 acres (4.2 %) of the riparian woodland would be removed by the Proposed Action during construction. About 251 acres of riparian woodlands would develop following construction of the Proposed Action, for a net increase of 237.7 acres (+75 %). This represents a significant beneficial impact. The number of individual trees to be impacted by the Proposed Action is 973. Through final design, it is estimated that impacts can de reduced to less than 800 trees. One of the substantial benefits of the Proposed Action is that natural fluvial processes would be reinitiated and recruitment of riparian woodlands would continue into the future with little additional active management. The text of Section 3.4.5.5 and Section 3.4.6.3.3 of Chapter 3 of the Final EIS has been revised to include this comparison.

22.13 Cont. regeneration of cottonwood trees is lacking and the riparian ecosystem can be expected to decline in quality unless measures are taken to restore this resource. The Proposed Action Alternative offers a unique opportunity to enhance this habitat type, which is extremely valuable to fish and wildlife and dwindling in supply on the regional and national level. We believe more elaboration on this benefit should be incorporated in the document.

22.14 3.5.6.3.1 (3) - A paraphrased EC that appears here and in 3.5.6.3.1.1 (3) is as follows:

- Access to construction areas by resident fish shall be reduced to the extent feasible and stranded fish will be salvaged and moved to appropriate locations. Salvage and relocation efforts will require coordination with the UDWR.

22.15 Table 3-17 (page 3-36) - We believe that there should be a footnote on the columns for the proposed action to remind the reader that the biomass and standing crop information does not include trout that will occupy side channels.

22.16 3.5.6.3.2.2 - Several ECs from the WCWEP DEIS concerning the leatherside chub that appear appropriate are as follows:

- A survey would be conducted prior to construction activities to identify leatherside chub population centers and learn more about the status of the species.

- Areas outside the impact area of influence that contain populations of leatherside chub that would benefit from habitat improvements would be enhanced and protected in accordance with an agreement to be developed with the Service and UDWR.

22.17 3.5.6.3.3.1 - This section fails to acknowledge that there will be temporary, but possibly significant, impacts to the spotted frog. The Draft Threatened and Endangered Species Technical Report for PRRP (Table 4-2) identifies that the proposed action "may effect" spotted frog. Spotted frog are known to be present within reaches seven, eight and nine of the Provo River and these populations could be temporarily disturbed. The Technical Report identifies that construction activities near or within occupied sites would result in altered hydrology, increased sedimentation, loss of protective bank vegetation, alter the water temperature and food composition, draining of water causing desiccation or freezing of egg masses or tadpoles, and reduced water quality. There would be a permanent loss of 55.2 acres and temporary loss of 22.2 acres of potentially occupied wet/moist meadows and emergent marsh habitat. The resulting effects would include a loss of breeding habitat, harm or mortality of individuals and reduced reproductive success caused by displacement of breeding adults and mortality. While the long-term effects are potentially beneficial, the temporary impacts could be significant because this Heber Valley population of spotted frogs is already fragmented and its viability is in question.

22.14 An EC similar to the one proposed is included in the Final EIS (see Appendix D).

22.15 A footnote has been added to Table 3-22 in the Final EIS to clarify that the data does not include trout that would occupy the side channels.

22.16 The Mitigation Commission has included your first recommendation as an EC (see Appendix D). The mitigation Commission has funded the Utah Division of Wildlife Resources to conduct leatherside chub surveys in Wasatch County, including the Project Area.

Regarding the second recommendation, since the time the recommendation was made, the FWS and DWR organized the Bonneville Basin Conservation and Recovery Team (BBCRT). The BBCRT is currently assessing the status and needs of threatened, sensitive species in the Bonneville Basin, including leatherside chub. The Mitigation Commission is an active member of the BBCRT. The Mitigation Commission commits to working cooperatively with the BBCRT and anticipates assisting with the leatherside chub conservation by acting on the recommendations of the BBCRT.

22.17 Please refer to comment response 13.11.

22.18 3.5.6.4.3.1 - This section fails to acknowledge that this alternative would result in temporary, but possibly significant, impacts to the spotted frog. The Draft Threatened and Endangered Species Technical Report for PRRP (Table 4-3) identifies that the proposed action "may effect" spotted frog. Spotted frog are known to be present within reaches seven, eight and nine of the Provo River and these populations could be temporarily disturbed. The Technical Report identifies that construction activities near or within occupied sites would result in altered hydrology, increased sedimentation, loss of protective bank vegetation, alter the water temperature and food composition, draining of water causing desiccation or freezing of egg masses or tadpoles, and reduced water quality. There would be a permanent loss of 22.9 acres and temporary loss of 100.9 acres of potentially occupied wet/moist meadows and emergent marsh habitat. The resulting effects would include a loss of breeding habitat, harm or mortality of individuals and reduced reproductive success caused by displacement of breeding adults and mortality. While the long-term effects are potentially beneficial, the temporary impacts could be significant because this Heber Valley population of spotted frogs is already fragmented and its viability is in question.

22.19 3.7.2 - This paragraph identifies those species that are eliminated from further consideration, and lists the June sucker because of a low potential for occurrence. The Service agrees that the June sucker does not occur within the Provo River between Deer Creek and Jordanelle Dams and, therefore, will not be directly influenced by the proposed action. However, the June sucker does use the lower Provo River for spawning and is dependent on appropriate Provo River flushing, spawning, and nursery flows for spawning cues, spawning habitat, successful reproduction, and larval development. the service has issued a Biological Opinion for the Provo River Project and has determined that Provo River Operations may affect the June sucker because of the potential to affect flows to the lower Provo River. We have determined that any and all affects to the species resulting from the Bureau of Reclamations Provo River Project and the Bonneville Unit of the Central Utah Project will be addressed in either the SFN-Bonneville Unit Biological Opinion or the Provo River Project Biological Opinion. We recommend that a statement to this affect be included in the discussion of impacts to endangered, threatened and candidate species.

22.20 3.7.5 - This references Table 3-23 which state that spotted frog habitat quality is optimal in areas currently inhabited. Is there a reference for this determination or is this a judgement call? The Service does not agree with this statement. The remaining spotted frog populations within the Heber Valley are most likely surviving in marginal habitats as these are the only habitats left available to them.

22.21 Cont. 3.19.2.1 (1) - Five commitments by the URMCC for mitigating wetland impacts are paraphrased in the following ECs:

- Steps will be taken during final design to reduce impacts on all wetland types to the extent possible.

22.18 Please refer to comment response 13.11.

22.19 The Mitigation Commission recognizes the existence of the Biological Opinion regarding operations of the Provo River Project. We concur that the June Sucker will not be directly affected by the Proposed Action. Potential for indirect effects is very low. We did not feel that it was appropriate to add the statement concerning the SFN EIS to the PRRP EIS. Therefore no change was made in the Final EIS.

22.20 The use of the terms "optimal", marginal", etc. are based on professional judgment. We concur that spotted frogs may be occupying marginal habitats in some locations, but based on recent surveys in 1997, at least some habitats in the impact area of influence appear more suitable. The text entry in Table 3-31 in the Final EIS has been revised to state that habitat conditions for spotted frogs are "marginal to good in areas currently inhabited; marginal to poor elsewhere".

22.21 Thank you for your suggestion. EC's similar to those proposed have been added to the Final EIS (see Appendix D).

- Opportunities shall be sought to restore and enhance existing wetlands or to create wetlands within the reconstructed floodplain (Under the Proposed Action and Existing Channel Modification Alternative) so they would function and be maintained naturally through connection with the riverine hydrology as a project feature.

22.21 Cont.

- Emphasis on management of project lands that are acquired adjacent to the 2-year floodplain shall be on the protection, enhancement or restoration of existing wetlands rather than other uses that are not compatible with this purpose.

- Other wetland restoration opportunities to provide high value wetlands protection and management capabilities outside of the immediate project vicinity shall be sought.

- Opportunities to maximize wetland values within the floodplain area will receive priority in the development of mitigation plans rather than the construction of such features as diversions and dikes for creating new wetlands.

22.22 3.19.2.4 (1) - Properties acquired for mitigation shall be monitored twice yearly during the growing season to evaluate soil moisture, side channel flows, plant succession, regeneration and production, weed invasion, species diversity and the presence of threatened and endangered species, and determine if mitigation goals are being met. A report is to be prepared to document findings and identify actions needed to assure that the mitigation properties reach their full wetland-value potential.

We suggest modifying the language in this paragraph to include the monitoring of candidate as well as threatened and endangered species. Also, we believe that annual reports of findings and recommendations are probably intended rather than one report (ie. "a monitoring report").

22.23 Suggested ECs are:

- Mitigation properties shall be monitored twice yearly during the growing season to evaluate soil moisture, side channel flows, plant succession, regeneration and production, weed invasion, species diversity and the presence of candidate, threatened and endangered species.

- Annual reports shall be prepared to document the results of monitoring the mitigation properties and identify actions needed to assure the achievement of optimal wetland values.

22.22 The Commission has developed a study plan for wildlife and vegetation to achieve the objectives expressed in your comment. However, the timing, location and frequency of data collection, analysis, and reporting will be determined according to the type of data collected. The Commission believes monitoring of some of the identified parameters on a twice-yearly basis is not appropriate.

The Commission will share all collected information by holding annual briefing sessions with the cooperating agencies. A comprehensive report will be prepared after the third year of data collection (i.e., 1999).

22.23 Please refer to comment response 22.22.

22.24 3.19.3 - The draft BO states the Service's opinion that the Proposed Action (Riverine Habitat Restoration) would result in a may affect situation for the bald eagle because of anticipated losses of cottonwood trees that are used for roosting and perching.

A discussion of this potential impact on the bald eagle needs to be included in this part of the DEIS.

3.19.3. (1) - It is stated that riparian woodlands in the constructed floodplain under the Proposed Action and Existing Channel Modification Alternative are expected to replace habitat for the Ute ladies'-tresses orchid; however, if necessary additional measures to protect this orchid will be identified and implemented.

The Ute ladies'-tresses orchid is generally found in open areas with cobble substrates such as point bars and in mixtures of short grasses along channel banks and wet meadow habitat types rather than in understories of riparian vegetation.

Following is a list of ECs that are pertinent to the two threatened species (Ute ladies'-tresses orchid and bald eagle) that we have paraphrased from the Service's BO:

22.25 Cont.

- The planning agency shall designate an individual to serve as the contact representative to oversee compliance with terms and conditions set forth in the Service's BO.
- The contact representative shall ensure that contractors are aware of terms and conditions contained in the Service's BO, and be invested with authority to halt activities that may be in violation.
- Those involved in the construction and its oversight shall be informed, through an educational program that: (a) the bald eagle is federally listed as a threatened species; (b) explains "take" as defined by the Endangered Species Act, and the potential penalties (up to $25,000 in fines and six months in prison) for taking a listed species; and (c) explains the terms and conditions set forth in the Service's BO.
- Project related personnel shall not be permitted to have firearms in their possession while on the site.
- Construction shall be planned in a manner to minimize losses of mature cottonwood trees.

22.24 The Final EIS (Table 3-32) summarizes the impacts of the Proposed Action on bald eagle and other T&E species in the Project Area. Due to adjustments in the Proposed Action, the number of mature cottonwood trees expected to be removed by construction has been reduced from 1216 to 856 trees. The area of riparian woodland vegetative community to be removed has been reduced from 9.7 acres to 6.1 acres. These changes help reduce the likelihood of adverse impacts on bald eagle through loss of perching or roosting sites.

The Biological Opinion issued by the FWS concurs that the PRRP Proposed Action would have no effect on bald eagle.

22.25 The suggested environmental commitments have been included in Appendix D (Environmental Commitments in the Final EIS), except as revised by mutual agreement. The recommendation to collect seeds from Ute ladies'-tresses that occupy the project area prior to project implementation that could affect existing populations has been dropped. Genetic testing performed on the Provo River populations at the request of the Mitigation Commission in 1996 have indicated no detectable differences between Provo River specimens and others from other locations. Therefore this recommendation has been dropped by the Fish and Wildlife Service in the Final Biological Opinion for the PRRP.

22.25 Cont.

- Cottonwood trees in ROWs shall be salvaged for use in reestablishing cottonwood trees in riparian areas and to provide materials for fisheries habitat improvements.[8]

- As appropriate, the floodplain shall be fenced to allow management of cattle grazing and increase the chance for regrowth of cottonwood trees.[9]

- Parking and storage areas for equipment and materials used for construction and maintenance shall be confined to disturbed sites that have little or no value to fish and wildlife.

- Maintenance on equipment used in construction or for post-project maintenance shall be preformed off-site or in designated areas that have little or no value to fish and wildlife.

- A contingency plan shall be developed in the event of inadvertent spills of petroleum or other toxic substances.[10]

- Hazardous materials such as explosives, solvents, gasoline, diesel, and lubricants shall be stored in safe areas away from waterways and sensitive plant communities and fish and wildlife habitats.

- In the event of inadvertent spills of toxic substances the National Response Center, U.S. Coast Guard Headquarters, Washington, D.C. (telephone 1-800-424-8802) and the Utah Environmental Response and Remediation Division, 168 North 1950 West, P.O. Box 144840, Salt Lake City, Utah 48114-4840 (telephone 1-801-536-4100) shall be promptly notified.[11]

- In the event dead, injured, or sick eagles are encountered, the Service's Division of Law Enforcement, Salt Lake City, Utah (telephone 1-801-975-3632) and the Utah Division of Wildlife Resources, Central Regional Office, 1115 North Main Street, Springville, Utah 84663 (telephone 1-801-489-5678)

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[8] This EC expands upon the terms and conditions presented in the BO to include salvaging of materials for fisheries habitat improvements. In general anchoring large cottonwood trees with sufficient stump for keying into banks and extending the root wad into the stream is an effective technique for scouring pools that are used for resting and cover by fish. The limbs are used for cuttings to reestablish cottonwood trees. Techniques for the removal and preparation of salvaged trees need to be developed in consultation with botanists and fisheries habitat improvement biologists.

[9] This EC was presented in comments on 1.11 (3) of the WCWEP DEIS. (See previous footnote Number 7.)

[10] This was not included in terms and conditions of the draft BO on PRRP.

[11] This was not included in terms and conditions of the draft BO on PRRP.

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shall be promptly notified for guidance on procedures for their care or preservation and transport.[12]

- Notification of dead, injured, or sick eagles shall also be given to the Utah State Field Supervisor, Ecological Services, U.S. Fish and Wildlife Service, 145 East 1300 South, Suite 404, Salt Lake City, Utah 84115 (telephone 1-801-524-5001) within three days of discovery.

- An annual report that summarizes encounters with dead, sick, and injured eagles shall be provided to the Service. The date, time, and probable or confirmed cause of the injury, mortality or sickness; and other pertinent information shall be included in this report.

- The Service's Ecological Services Office, Salt Lake City, Utah shall be advised when activities that comply with conditions and conservation measures set forth in BOs are being performed and when they have been met.

22.25 Cont.

- The benefits associated with implementation of terms and conditions and conservation measures contained in the BO shall be monitored and periodic reports summarizing the findings shall be submitted to the Service

- Formal consultation on threatened and endangered species shall be reinitiated if necessary to comply with 50 CFR 402.16.

- A monitoring plan for the Ute ladies'-tresses orchid approved by the Service and developed in consultation with Service, URMCC, and Utah Natural Heritage Program staff biologists shall be implemented.

- Prior to construction, seeds from Ute ladies'-tresses orchids that inhabit the project area shall be collected to serve as a source of new individuals in newly created habitat or to reestablish existing populations if they are extirpated.

- Conditions necessary for continued viability of the Provo River population of Ute ladies'-tresses orchid shall be maintained, including "artificial" maintenance of habitat conditions, until such activities are deemed by the Service to be longer necessary or warranted.

- To maintain hydrologic conditions necessary for the existing colonies of Ute ladies'-tresses orchid, project designs shall allow water to overflow into

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[12] Requirements in the BO have been expanded here to include the golden eagle as well as the threatened bald eagle, both of which are protected under the Eagle Protection Act (14 U.S.C. 668-668d) and the Migratory Bird Treaty Act (16 U.S.C. 701-718h). The bald eagle is protected under the Endangered Species Act, although the golden eagle is not.

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22.25 Cont.

occupied side-channels from the new river location. If determined feasible, backwater wetland areas shall be reconstructed near orchid colonies with hydrologic connection to the new river channel.

- The URMCC shall work with the Service to design and manage wetlands reconstructed within the abandoned channel of the Provo River, newly acquired public land, recreation access points, and trails in a manner that will allow establishment and maintain viability of Ute ladies'-tresses orchid colonies while meeting other project purposes.

22.26 Cont.

3.19.3.2 (1) - Initially there will be unavoidable impacts to the spotted frog and its habitats if the Preferred Alternative is implemented; however, habitat areas suitable for this species would be ultimately be enhanced. It is essential that adequate measures be incorporated to protect the species during the interim period when habitat is restored and enhanced. Although there is sufficient information to list the species as threatened or endangered under the Endangered Species Act, a "Spotted Frog Conservation Agreement Team" has been established to determine measures that can be adopted to protect the species without official listing. The URMCC should work closely with the Team and assist in protection and recovery efforts. The Service has developed the following tentative ECs for your consideration and discussions with the Team:

- The URMCC shall cooperate with the Spotted Frog Conservation Agreement Team by: (1) arranging for proper surveys of spotted frog habitats within the project area, (2) identifying measures needed to minimize impacts to the extent practicable, and (3) implementing feasible measures to protect the Heber Valley population of spotted frogs and enhance its habitat.

- Surveys for spotted frog egg masses shall be conducted during the breeding period (April-June) during the year construction is scheduled in order to more accurately identify occupied areas.

- The final project plan and design will avoid and minimize impacts to the spotted frog and its habitats to the maximum extent practicable.

- Occupied breeding sites that are near construction zones shall be delineated with orange fencing and posted with signs stating, "conservation area - do not disturb".

- A protocol shall be developed for translocating spotted frogs out of areas that will be drained or directly impacted prior to and during construction.

- Temporary refugia and permanent habitats where translocated spotted frogs can be introduced shall be inventoried at the earliest date possible, and

22.26 The Mitigation Commission is cooperating on the development and implementation of the Conservation Agreement for Spotted Frog in Utah. Several of the measures you recommend have already been initiated with funding and involvement by the Mitigation Commission in addition to other cooperators. Final ECs (see Appendix D) and SOPs (see Section 1.9.6.1 of the Final EIS) have been developed in consultation with the Spotted Frog Conservation Team and the Spotted Frog Advisory Team (see Section 4.2.2.2 of the Final EIS and Appendix H).

Please refer to comment response 13.11.

22.26 Cont.

opportunities to enhance habitat conditions for the species shall be promptly initiated and implemented.

- Barriers to prevent translocated spotted frogs from returning to their former habitats shall be maintained between the construction site and adjacent undisturbed habitat throughout the construction period.

- A long-term monitoring plan to determine the success of habitat recovery and relocation efforts shall be developed in cooperation with the Spotted Frog Conservation Agreement Team.

- Should monitoring results demonstrate a need for additional measures to avoid losses of spotted frogs, feasible improvements shall be implemented as quickly as possible.

22.27

3.20.3 - It is erroneously stated here that unavoidable adverse impacts of the Proposed Action and alternatives would be the same as presented in the WCWEP and DRP DEIS.

Ultimate long-term benefits to habitats of the Ute ladies'-tresses orchid and spotted frog are anticipated with the Proposed Action Alternative for PRRP; however, in the short-term it is expected that the project would have adverse impacts to these species. The WCWEP is expected to have no direct effect on these two species. The July 11, 1996 BO on the WCWEP concurred in a finding of no effect on the Ute ladies'-tresses orchid. The spotted frog was not addressed in the BO because it is not a federally listed species. The Service has concern that lowering groundwater levels in certain parts of Heber Valley as a result of the WCWEP Preferred Alternative could impact spotted frog habitats, and ECs to avoid impacts are included in the Service's comments on the WCWEP DEIS.

22.28

Appendix A - A.2.1 (3) - It is stated that control of Canada thistle is especially important in areas that support Ute ladies'-tresses orchid because the thistle forms monocultures that out-compete the orchid. We believe that this same statement could be made for most of the other native thistles addressed in subsequent paragraphs.

22.29

A.3.1 (1) - It is mentioned that desirable plant covers shall be established as soon after construction as possible. Interim seeding of topsoil stockpiles that would be barren for more than a month will be necessary; and permanent seeding of disturbed areas will be conducted at the completion of earth-moving activities. Table A-1 is a list of plants that are being considered for seeding disturbed areas. We recommend that whenever possible, native plants be used in revegetation unless revegetated areas are to be used for agricultural purposes. Non-native species such as smooth brome that tend to spread into areas with native vegetation should be avoided.

Weeds that are identified as noxious or undesirable would be chemically controlled or hand-removed before they develop seeds or have opportunity to spread and establish large

22.27 The text of Section 3.20.3 in Chapter 3 of the Final EIS has been revised to accurately reflect the Service's determination that short-term impacts may occur to Ute ladies'-tresses habitats from the Proposed Action.

22.28 The Commission's noxious weed control program will target most of the native thistles (please refer to the revised Appendix A in the Final EIS).

22.29 Thank you for your suggestions. The Mitigation Commission is working with a group of cooperators (including botanists, ecologists, and plant reclamation specialists) to develop a monitoring program for vegetation in the Project Area. The group will also assist in developing a final comprehensive revegetation plan for the PRRP after a Record of Decision is issued. Please see Appendix A in the Final EIS for the revised Noxious Weed Control Plan. The Mitigation Commission will follow this plan and additional recommendations of cooperators.

Monthly weed surveys will be conducted and undesirable weeds will be regularly removed from construction areas and soil stockpiles. Those piles left unused for over one year will be seeded with an appropriate seed mix

Areas disturbed during construction will be passively revegetated by natural processes or actively revegetated with seed and/or other plant materials. The Mitigation Commission favors planting with indigenous riparian plant types over exotic types and will avoid using exotic plant types when and where possible.

22.30 colonies. Fall and spring surveys would be conducted to identify and locate perennial and biennial weeds in their early stages of development. Photographs or drawings of noxious weeds that may occur in the area will be distributed to contractors to help identify weeds and take steps to eradicate them using approved techniques. Here, the word, "noxious" is not used. We do not believe that poison hemlock and purple loosestrife are presently on Utah's Noxious Weed List; however, we agree that effort should be made to eliminate these species from the project area.

22.31 There will probably be plants that some will regard as weeds, but that biologists have no interest in seeing controlled. Perhaps it may best to refer to species that are to be controlled as noxious or undesirable plants.

It seems unlikely that weekly surveys immediately after construction would reveal the presence of noxious or undesirable plants. We agree that there should be frequent surveys and that spring and fall surveys to identify and locate perennial and biennial noxious or undesirable plants is appropriate. Likewise, we agree that a program to educate construction and other personnel who may be able to help identify locations of noxious or undesirable plants in the project area would probably be helpful.

22.32 A.3.3.4 (1) - It is stated that mechanical or hand control of noxious weeds in construction areas would be used as an alternative to herbicide application, and that weeds collected by these methods would be burned or properly disposed of to avoid their spread to other areas.

In the vicinity of sensitive habitats, such as those occupied by the Ute-ladies'-tresses orchid or spotted frog, hand removal would be preferable to the use of herbicides.

22.33 Cont. We have developed the following list of ECs for your consideration:

- Noxious weeds and undesirable plant surveys shall be conducted until such time that monitoring demonstrates that they are no longer a problem in the project area and the project is no longer contributing to the spread of these plants.

- Desirable, preferably native, plants that will help control erosion and inhibit the spread of noxious weeds and undesirable plants shall be seeded on disturbed areas as soon as possible after construction is completed.

- Stockpiles of top soil that would remain barren for periods in excess of one-month shall be managed appropriately to control erosion and avoid proliferation and spread of noxious weeds and undesirable plants.

- A program to educate contractors and others who are in field positions in the identification of noxious or undesirable vegetation shall be implemented. The participants shall also be provided with photographs or drawings of these

22.30 Please refer to comment response 22.29.

22.31 Please refer to comment response 22.29.

22.32 Please refer to comment response 22.29 and the SOPs (Section 1.9.6.1 of the Final EIS).

22.33 Please refer to comment response 22.29.

species, and informed of procedures for reporting locations where they are observed.

- Noxious weeds and undesirable plants shall be controlled by chemical, mechanical, hand removal, and biological means, as may be appropriate, with due consideration given for compatibility with wildlife management plans, needs for protecting native plant communities, and avoidance of environmental contamination. Approved procedures and required permits shall be obtained for the controls that are used.

22.33 Cont.

- Noxious and undesirable vegetation in the vicinity of Ute ladies-tresses orchid colonies and spotted frog habitats shall be controlled by methods that avoid or minimize impacts to these species or their habitats.

- Weeds removed by mechanical or hand control methods shall be burned or properly disposed of to prevent their spread to other areas.

We appreciate this opportunity to comment on the DEIS for the PRRP.

Sincerely,

Reed E. Harris

Reed E. Harris
Utah Field Supervisor

cc: Ms. Karen Ricks, Project Manager, Wasatch County Water Efficiency Project, Central Utah Water Conservancy District, 355 West 1300 South, Orem, Utah 84058
Mr. Ron Johnston, Program Director, CUP Completion Act Office, U.S. Department of the Interior, 302 East 1860 South, Provo, Utah 84606-7317
Geographic Assistant Regional Director (CO/KS/NE/UT), U.S. Fish and Wildlife Service, P.O. Box 25486, Denver Federal Center, Denver, Colorado 80225

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SALT LAKE COUNTY WATER CONSERVANCY DISTRICT

David G. Ovard, *General Manager, Secretary-Treasurer*
Richard P. Bay, *Asst. General Manager, Chief Engineer*

August 13, 1996

Mr. Michael C. Weland
Executive Director
Utah Reclamation Mitigation and Conservation Commission
355 West 1300 South
Orem, Utah 84058-7303

HAND DELIVERED

Dear Michael:

RE: Written Comments to the Draft Environmental Impact Statement on the proposed Provo River Restoration Project

Please accept the following as written comments to the Draft Environmental Impact Statement (DEIS) on the proposed Provo River Restoration Project (PRRP). Comments are based on our staff reading of the DEIS, attendance at the public hearings, and conversation with CUWCD staff.

Peak Releases from Jordanelle Reservoir

23.1 Section 3.2.3.1 lists the following surface water issue that was raised during scoping: "What impacts would the PRRP have on reducing peak flow rates from Jordanelle Reservoir during the summer months?" We do not feel that the issue was sufficiently addressed in the DEIS. Section 3.2.6.3.1 discusses the proposed change in travel time between Jordanelle and Deer Creek Reservoirs without addressing the issue of peak releases from Jordanelle. Further, the same section uses an assumed flow rate of 500 cfs to calculate travel time. We anticipate much higher releases from Jordanelle Reservoir during the summer months.

In order to deliver CUP M&I water from Jordanelle in the summer months, flow rates will exceed 360 cfs. This flow rate, coupled with irrigation deliveries from Jordanelle, plus the upper Provo River flows and transbasin diversions passing through the reservoir, will exceed 700 cfs. The DEIS must address these higher flow rate demands from Jordanelle both in its impact assessments and physical design parameters. The flow rates required to satisfy prior water rights and CUP M&I demands must be documented in the DEIS.

8215 South 1300 West • P.O. Box 70 • West Jordan, Utah 84084-0070 • Phone (801) 565-8903 • Fax (801) 565-8917

Responses to Comment Letter No. 23

23.1 Thank you for your comment. The analysis described in Chapter 3, Section 3.2.6.3.1 of the Draft EIS is adequate. The Final Supplement to the Final Environmental Statement for the Municipal and Industrial System (USBR 1987) describes the operation of Jordanelle Reservoir. The PRRP will not affect flow volumes between the two reservoirs. Water rights and contract requirements for delivery of CUP water will remain unaffected. The flow rate of 500 cfs was selected for analysis purposes to determine the relative change in travel time of Provo River flows between the reservoirs (a flow of 500 cfs was determined to be representative of average conditions, e.g. midway between the baseline average in the 1987 FES for the Municipal and Industrial System (USBR 1987) of 346 cfs, and the range of flows mentioned during scoping i.e. flows between 600 and 700 cfs). Chapter 1, Section 1.7.3.1 of the Draft EIS described the intent to try to manage water releases from Jordanelle Reservoir to promote revegetation of constructed areas through natural processes and to reduce the potential for scour of reconstructed areas while vegetation is becoming established. Such recommendations will be coordinated with involved water management agencies to protect water rights and water delivery requirements. Section 3.2.2 of the Final EIS **Issues Eliminated from Further Analysis** has been revised to include this discussion.

SALT LAKE COUNTY WATER CONSERVANCY DISTRICT

Mr. Michael C. Weland
Utah Reclamation Mitigation and Conservation Commission
August 13, 1996
Page 2

Water Quality

23.2 In addition to those water quality parameters studied in the DEIS, contaminants regulated by EPA drinking water standards should be reviewed. Use of water from the Provo River for drinking water purposes increases each year. The slightest increase to some regulated constituents can translate to large capital expenditures at drinking water treatment plants and violation of Federal and State laws. These contaminants should be reviewed specifically as a result of the increased human activity in and around the Provo River channel offered by this project.

Liability

23.3 The DEIS does not address the increased liability of constructing facilities that allow increased human exposure to the Provo River and the resulting water quality changes. Entities that will be assuming the liability resulting from the PRRP should be listed in the DEIS.

SLCWCD Water Rights and CUP Petition

23.4 According to the Petition to the Central Utah Water Conservancy District for Allotment of Water for Municipal and Industrial Use, dated June 10, 1971, Salt Lake County Water Conservancy District (SLCWCD) has been granted 50,000 acre-feet of M&I water annually from the Central Utah Project. The full annual delivery of that water must be met according to the Petition, which includes making deliveries upon demand at times and flow rates required by SLCWCD.

In addition, SLCWCD owns Provo River rights, stock in the Provo River Water Users Association, upper Uinta Lake storage rights, and Weber River rights and Weber River Water Users Association stock that is transported in the Provo River. The Provo River Restoration Project must not affect the delivery of CUP water under SLCWCD's petition or its other water rights and stock holdings in quantity, timing, delivery, or quality.

23.2 The water quality parameters analyzed in the Draft EIS were determined through extensive scoping and input from regulatory agencies and are adequate. The Provo River between Jordanelle Dam and Deer Creek Reservoir is classified by the Utah Division of Water Quality for the following uses:

Class 1C:	Protected for domestic purposes with prior treatment by treatment processes as required by the Utah Division of Drinking Water.
Class 2B:	Protected for secondary contact recreation such as boating, wading, or similar uses.
Class 3A:	Protected for coldwater species of game fish and other cold water aquatic life, including the necessary aquatic organisms in their food chain.
Class 4:	Protected for agricultural uses including irrigation of crops and stock watering.

The Draft EIS adequately analyzed the potential impacts of the Proposed Action and its alternatives on the water quality parameters which would affect the above uses. Increased human use in and around the river channel would not have adverse impacts on any of the water quality parameters. Public access and parking areas would be equipped with sanitary facilities and regular trash pick-up. Pollutant inputs from livestock grazing in the river corridor would be reduced by the Proposed Action.

23.3 Your comment asks who would be liable for impacts on water quality because of potential for increased human exposure to the Provo River from the PRRP. No significant adverse impacts on water quality are predicted from the PRRP. The Draft EIS addressed this concern and determined it not to be an impact (see Chapter 3, Section 3.3.6.2 Water Quality - Potential Impacts Eliminated From Further Analysis) because public access areas will include restrooms and trash receptacles. Operation and maintenance will be provided through management agreements to manage refuse. Therefore no significant adverse impacts will result, and the Mitigation Commission will not speculate as to the liability of other parties for water quality impacts.

23.4 Thank you for your comment. The PRRP alternatives are designed to function with the water rights and CUP project deliveries described under baseline by the 1987 Final Supplement to the Final Environmental Impact Statement for the Municipal and Industrial System, which includes the flow releases addressed by your comment. Section 3.2.2 of the FEIS Issues Eliminated from Further Analysis has been revised to include this discussion.

SALT LAKE COUNTY WATER CONSERVANCY DISTRICT

Mr. Michael C. Weland
Utah Reclamation Mitigation and Conservation Commission
August 13, 1996
Page 3

Thank you for the opportunity to comment on this DEIS. We request that all further notices be send to us regarding this DEIS and related issues.

If you have any questions, please feel free to call me.

Sincerely,

David G. Ovard

David G. Ovard
General Manager

TIF/vh

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August 10, 1996

Michael C. Weland
Executive Director Utah Reclamation Mitigation
and Conservation Commission
355 West 1300 South
Orem, UT 84058-7303

Dear Mr. Weland,

I would like to submit a written response to the proposed Provo River Restoration Project which was filed on June 10, 1996 as a part of the Central Utah Water Conservancy District. I am a land owner having purchased property from Hugh Hoagle along the Provo River in Charleston, Utah.

I did not receive the draft environmental impact statement until several weeks after it was released to the public. I am serving a full-time mission for The Church of Jesus Christ of Latter-day Saints and was not aware of it's existence until it was reported to me by a local neighbor several weeks after he had received it. I therefore am submitting this to you as early as I could conveniently review all of the material.

My property, as mentioned, is located on the Provo River and would be impacted dramatically by the proposed Provo River Restoration. There are two issues that were not addressed in the Environmental Impact Statement that I have specific concerns with.

24.1 1. I have an approximate six acre pond which is next to the Provo River and which contains beautiful wetlands vegetation and wild life. Many species of ducks and migratory fowl nest and live on the pond. There seems to be no specific discussion about what environmental impact large equipment and the moving of the River might have on the nesting of these wild animals nor what permanent damage it may do to the species which have frequented our area and the Heber Valley. I am concerned that with the proposed time table to accomplish the moving of the River that it would be extremely harmful to the wild life which now frequent our land and particularly this pond which is so close to the River.

Responses to Comment Letter No. 24

24.1 Thank you for your comment. The Provo River Restoration project will not directly impact the six acre pond that you are concerned about. However, as you have correctly pointed out, construction activity could disturb wildlife. To mitigate for these potential impacts, several actions will be taken: 1)limit construction in any one segment to two years; 2) phase construction so some segments will be undisturbed while others are under construction (this will give displaced wildlife temporary refuge during construction); 3) avoid impacts to Reach 4 and reduce impacts to Reaches 7 and 8 (these large patches of riverine vegetation are consistent with the restoration objectives and therefore will not be disturbed). The integrity of the pond embankment could not be damaged by equipment vibration and if the final restoration plan calls for the river to be located adjacent to your pond, and the pond embankment is imminently threatened, then erosion protection will be included in the restoration design.

24.2 2. Because this pond is in some cases, 20 and 30 feet deep with thousands of gallons of water, I am concerned about the damage to the dike area and the possible movement or damaging of the water system which is now presently in place. With heavy equipment moving the River so close to this Wetlands area I am afraid that it may have a drastic negative impact on the pond structure and upon its ability to safely hold water. The cause being the vibration of heavy equipment. There seems to be no discussion of these issues regarding what might negatively impact my property.

I would appreciate your comments regarding these matters inasmuch as they concern me greatly.

Thank you for your consideration.

Very truly yours,

Dennis R. Webb

Dennis R. Webb

24.2 Please refer to comment response 24.1.

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Peter Hovingh
721 Second Avenue
Salt Lake City
Utah 84103

(801) 359-4791

August 6, 1996

Michael C. Weland, Executive Director
Utah Reclamation Mitigation and Conservation Commission
111 E Broadway, Suite 310
Salt Lake City
Utah 84111

Dear Mr. Weland:

Concerning the Provo River Restoration Project Draft EIS:

Heber Valley is a unique area in Utah. Provo River (and Weber River) are very ancient rivers. Stokes (Geology of Utah, 1986, Occasional Paper #6 of the Utah Museum of Natural History, papge 150) thought that the Provo River once flowed from West to East and that after the collapse of the Great Basin and the rise of the Uinta Mountains some 30 to 25 million years ago, the direction reversed to the present course. During the Pleistocene multiple cycles of glaciers and lakes, Heber Valley was a refugia for all aquatic fauna that could not survive the large lakes or glaciated valleys. The Pleistocene processes of alternative deep lakes and glaciated valleys with shallow lakes and glacier-free valleys formed bottlenecks in population dynamics, resulting in the evolution of two genetically distinct spotted frogs in the Bonneville basin (the other refugium is in Deep Creek in Snake Valley, western Utah). It is from this Heber Valley that all spotted frogs in Utah, Salt Lake and Summit Counties are derived in the last 12,000 years after the decline of the last pluvial deep lake, Lake Bonneville. Mollusks and leeches have followed this same post pluvial distribution pattern as the spotted frog, although these fauna groups may not have differentiated (there are no studies, yet).

25.1 Within this framework, I have examined the Provo River Restoration Project Draft EIS. I conclude that this project has great potential, but it is presently design to increase fish production and fishing aesthetics and will probably accomplish these goals. This project will not restore the Provo River to the river of 1849. That river is gone and will never return. Then what will be restored in the Provo River? I do not know. German Brown Trout and California Rainbow Trout are not native fishes. One stated goal is "to increase biological productivity and diversity within the Provo River ecosystem". Trout productivity will certainly be increased, but will biological diversity be increased?

Responses to Comment Letter No. 25

25.1 Thank you for your comments and participation with the PRRP Spotted Frog Advisory Team. As you have pointed out, the Provo River has been greatly altered and restoration to a pre-European settlement condition is not possible. However, the condition and biological productivity of this river can be greatly improved. In the case of the Proposed Action, restoring a meandering geometry and restoring other physical processes will increase hydraulic and riparian habitat diversity. In addition, these restored geomorphic processes will continue to perpetuate habitat diversity. The analysis described in the Draft and Final EIS predicts that these changes will greatly enhance the abundance and diversity of the biological community. The other PRRP alternatives would achieve these objectives to a lesser degree (see Chapter 2 of the Final EIS) using different approaches to restoring or creating habitat diversity.

The PRRP will not be managed for only one or a few species. The Proposed Action and its alternatives attempt to create the broadest range of habitat types that are appropriate for the geomorphic and climatic setting that can be achieved under each alternative. The Mitigation Commission and cooperators are conducting several studies to determine habitat requirements of riparian birds, spotted frogs and other amphibians, small mammals including bats, aquatic invertebrates, native and sport fish, and riparian vegetation including the threatened Ute ladies'-tresses. Information gained from these studies, as well as information from the technical literature, will be incorporated into the final design and will be considered in developing a management plan (see Section 1.4.2 of the Final EIS).

25.2 There is mention of providing floods every two years. Does not a river flood every year, and in the case of the Provo River, this flooding occurs in June. Floods in rivers start in the headwaters and is a continual process throughout the river drainage. Floods do not start from dams and reservoirs. Floods change the river courses. This project is designed with stream bank stabilization (large artificial rocks places in the outward bend of the created meanders). Floods always contain waters with sediment, and yet sediment (erosion) is to be controlled. "Natural cottonwood recuitment depends on the dynamics of flood flows that cause surface scour and sediment deposition" (Page P 3-18). How will this occur when the stream banks are stabilized? Can you really call a flood a movement of water 0.1 to 0.5 feet deep that is released from a dam and reservoir?

25.3 Flood plains contain many kinds of aquatic habitats. Old ox bows sometimes obtain new water from surface floods. Most often they receive new waters by hyporheic flows (a form of ground water associated with rivers and has a unique, largely blind and albino, biotic community in its own right). These habitats would be largely fishless and very promising for amphibians and amphibious fauna. Only fish lakes and ponds (15 feet deep) are proposed in the PRRP and these ponds will have a continuous flow of water input and fish from synthetic channels. The entire flood plain in PRPP is designed for fish production. Will there be any attempt to create, or preferrably have formed naturally, temporary ponds of duration for 2 weeks to 10 months with no channels to the fish inhabiting waters? These would be your typical mosquito ponds but the longer lasting ponds have greater biological diversity (Schneider and Frost, 1996. Habitat duration and community structure in temporary ponds. J. N. Am. Benthol Soc. 15: 164-186).

25.4 There is comparison of PRRP with two other projects that have occurred (P 3-35). This assessment is fully appreciated. It would be of interest (to me) to know if the East Fork of the Sevier and the Bear Valley Creek have dams and reservoirs above their improved river reaches and even below their river reaches. One can greatly improve the rivers by staying within the natural confines of the river. It takes very little effort to improve rivers if the rivers are not heavily impacted.

There is the question of "Other Aquatic Resources". I have spent considerable time now in examining the collections of mollusks and leeches and amphibians in the nations museum collections (this project will continue for another 5 years). In part, this project evolved out of a need to determine what the Great Basin and Colorado River Basin historically contained and in part, out of a need to understand the geography of the aquatic fauna within these basins. Parallel efforts have been to inventory the aquatic fauna (mollusks, leeches, and amphibians) in the Great Basin. There is a large disparaty between what was found 50 years and 100 years ago and what is found now. The amphibians (leopard frog, Woodhouse toad and boreal toad) have been largely exterminated from Heber Valley, probably do to loss of breeding habitat (no fishless ponds of several feet deep). The mussel *Margaritifera falcata* may no longer occur in the Provo River although shells are still occasionally found as a reminder of past

25.2 Please see response to comment 25.1.

25.3 Please see response to comment 25.1.

25.4 Please see response to comment 25.1.

occurrences. This mussel larvae requires a trout or salmon host for survival (not whitefish). Managing streams for trout has not been good to this mussel and its disappearance from the best trout streams in the Great Basin portions of California, Nevada, Utah, Idaho, and Wyoming does not speak well for biodiversity. A parallel loss occurs with the limpet *Ferrissia rivularis* which was noted in the Provo River in early surveys (Winger, Peters, Donahoo, Barnes, White, 1972. A checklist of the macroinvertebrates of the Provo River, Utah. Great Basin Nat. 32: 211-219). I have found one limpet above the bridge just above the present Jordanelle reservoir and one limpet in Reach 6 of the present project area. In the Humboldt River (Nevada) and its tributaries, by comparison, I can find a limpet on every other rock, for the most part. The major difference between the Humboldt River and other Great Basin streams is that the Humboldt River does not support a game fishing recreation. In the Bear River and Weber River, the limpet has severely declined (Bear River) or may be exterminated (Weber River) in the last 35 years. Another gastropod, *Fluminicola* (the species and group is undergoing a taxonomic study) is found in Reach 3 of the Project and this location is the only location in the entire Provo River. *Fluminicola* has declined in eastern Great Basin streams and largely persists in outflows of springs where water quality and quantity occur. This gastropod was very common in Utah Lake when the annual spring flood waters largely purged Utah Lake of its waters (Utah Lake should really be considered as a slow moving river prior to 1849). I ask the question of the Provo River Restoration Project: How will this project effect the populations of unique (at least for now, but not historically) aquatic fauna? Will this project contribute to their destruction? Will this project bring back the diversity of amphibians and mollusks to Heber Valley and Provo River flood plains? Or will the singled management goal of trout production and riparian habitat improvements drive additional species out of the drainage (and out of Utah?)?

25.5

Of high concern is the status of the spotted frog. Although it is found in Summit and Utah County (I still view Juab County population as potentially a distinct group and the San Pitch population is related to the Yellowstone group), the home of the spotted frog is in Heber Valley and here is where the frog will have to survive. An appendix is enclosed on an alternative mitigation and monitoring program. The project proposes more habitat available for spotted frogs (ponds and channels) as "the proposal action would have long-term benefits on spotted frogs by creating and enhancing habitat throughout the Provo River corridor" (P. 3-56). This includes the 5 feet wide on side channels as wetlands (3.4.6.3.1). Elsewhere, no trails will be developed in riparian zone, but "foot paths used by anglers along the river between access points would become established over time as angler use would increase by 662 percent (P. 3-50) and "walking, jogging, and wildlife observation" will increase (P 3-93). Thus, the habitat improvements for spotted frogs consists of brown trout in the troubled waters (a frog predator) and people flushing the frog into the water should the frog choose to come on land. This is not mitigation or improvement or recovery of spotted frogs in Heber Valley, but pure destruction. Then add the introduction of bass (purposely or via Deer Creek and Jordanelle where this spotted frog predator is being encouraged). The situation is not good for frogs. I would suggest that the entire Provo River Restoration

25.6
Cont.

25.5 Please see response to comment 25.1.

25.6 Please see response to comment 25.1.

25.6 Cont. Project be designed for amphibians, mollusks, and Bonneville cutthroat trout and see what options are then available for sport fishery and recreation.

25.7 Yet, with my background as a biologist, the goals of the project are noble for the times and for all the destruction that has occurred since 1849 by local inhabitants as well as by all levels of government. Perhaps the extensive goals of the project will never mitigate the past destruction. Provo River, between two Federal dams, will never be restored from my perspective. I would rather have 15 million dollars spent on supporting basic research in evolution, geography, paleoenvironments, and ecology.

Sincerely,

Peter Hovingh

Peter Hovingh

(Enclosed spotted frog mitigation proposal)

25.7 Thank you for your comment. It will be considered in the decision-making process.

MINIMAL MITIGATION EFFORTS FOR SPOTTED FROGS IN AFFECTED HABITATS OF WCWEP, DRP, AND PRRP.

Past efforts of the Jordanelle Dam and Reservoir Project have only consciously mitigated the destruction of spotted frogs by translocation of eggs, tadpoles, and adults. Since this effort was done haphazardly and not professionally, there is no way in which the mitigation and consequently the efforts of translocation can be assessed as to its effectiveness. One can not assume that dumping frogs in water is effective translocation and preservation. One can not assume that destruction of frog habitat and frogs and subsequently restoring the habitat will bring the frogs back.

Thus all adult frogs must be individually marked and monitored for the duration of the 30 year project that are involved with the affected habitat and any translocation. The techniques are well known for amphibians. If toe-clipping is used, the clipped toes must be preserved for genetic studies. Such studies are now occurring in Nevada, Idaho, and Oregon. Only by marking individual amphibians can one assess the results of such mitigation. As a corollary to the marking of spotted frogs, a thorough follow up must occur including resurveys throughout the frog season for at least 10 years and a full population analysis including growth and recovery population statistics, must be completed.

If the project effects the habitat of more than one percent of the total population in Heber Valley (1996 surveys show a total of 468 egg masses), then the project must create new habitat prior to the destruction of the old habitat that is fully functional for spotted frogs. Since the PRRP project claims that amphibians will like the final project, it is recommended that those stretches of river are first restored that do not have spotted frogs to offset future "temporary" losses to determine, if indeed, the river restoration is beneficial to spotted frogs. Construction of the project must first occur in those reaches that do not have frogs to assess if frogs will move into the new habitat.

All effected spotted frog habitat must be assessed in terms of geographical continuity with nearest populations. All barriers between the two populations must be removed including culverts.

If the project "improvements" involve more than 10% of the spotted frogs in Heber Valley, the Spotted Frog Conservation Team would be advised to emergency listing of the spotted frog as threatened or endangered.

The relationship on numbers of egg masses to numbers of juveniles and adults must be determined.

All of these efforts must be monitored by the Spotted Frog Conservation Team.

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DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

August 13, 1996

Regulatory Branch (199550735)

Michael C. Weland
Executive Director
Utah Reclamation, Mitigation and
Conservation Commission
355 West 1300 South
Orem, Utah 84058-7303

Dear Mr. Weland:

The Corps of Engineers' Utah Regulatory Office has completed its review of the Draft Environmental Impact Statement (DEIS) for the Provo River Restoration Project (PRRP). The following comments relate to the issues of alternatives, impacts, mitigation, monitoring, timing and baseline conditions.

We have several concerns and questions regarding alternatives. First, the document needs to explain more clearly how the Existing Channel Modification Alternative and the Instream Structures Alternative satisfy the purpose and need
26.1 statements for this project. For instance, neither of these alternatives appear designed to create a very naturally functioning riverine ecosystem; the Instream Structures Alternative in particular does not seem likely to "create a diversity of wetland and aquatic habitats". Second, is there a possibility that some hybrid of the three action alternatives might be chosen for implementation, e.g., the Proposed Action for Reaches 7-9, the Instream Structures Alternative for Reaches
26.2 5-6, and the Existing Channel Modification Alternative for Reaches 2-4? If such a combination could reasonably accomplish the purposes and needs of the project, it needs to be discussed. Third, if reasonable alternatives could include constructing only a portion of the project (e.g., Reaches 2-6) or constructing
26.3 non-adjacent reaches of the project (e.g., Reach 9 and Reach 4), these also should be discussed. We note that there is no 404(b)(1) Alternatives analysis included with the document. We recommend that such an analysis be included with the FEIS.

Responses to Comment Letter No. 26

26.1 Each of the alternatives analyzed in the Draft EIS has been developed through extensive public scoping and agency consultation. Section 4.2 of the Draft EIS describes the extensive planning and coordination that occurred in developing the PRRP alternatives. Each alternative was developed to respond to the Need for the PRRP (see Section 1.2.1 of the Draft and Final EIS), which was to meet mitigation requirements of past and present Reclamation water development projects which impacted fish and riparian habitats. The Purposes of the PRRP (see Section 1.2.2 of the Draft and Final EIS) add to the objectives of the PRRP. The degree to which the PRRP alternatives meet the purposes of the project will be among the factors considered by the Mitigation Commission and the in its decision-making process.

26.2 The three action alternatives and the No Action Alternative in the EIS represent the full range of approaches and impacts that have been identified through public scoping, agency and expert consultation, and review of the Draft EIS. No substantially different alternatives have been identified or developed. However, each of the PRRP alternatives have been evaluated on a reach by reach basis in the Draft and Final EIS. The Mitigation Commission and Department of the Interior may therefore combine some or all of the alternatives to make a complete project in its Record of Decision. It would not have been feasible to evaluate all of the potential combinations in the EIS, and no changes have been made to the Final EIS in this regard.

In coordination with the Corps of Engineers, a 404(b) (1) alternatives analysis has been developed and is included with the Final EIS (see Appendix H).

26.3 Please refer to response to comment number 26.2

26.4 We also suggest adding some information on the potential range of "major changes in the proposed alignment and profile" in the Proposed Action. Also, the range of changes in the Instream Structures Alternative that might be necessary during final design should include a description of the impacts of such changes. Since the Instream Structures Alternative design was prepared in 1991, it may need to be updated during final design to reflect state-of-the-art design in habitat improvement. Discussion of such changes in the FEIS might avoid the need to prepare a supplemental NEPA document after the FEIS has been prepared.

26.5 While we support the concept of trying to improve the riverine ecosystem of this portion of the Provo River, we also recognize that the environmental impacts will be considerable. In regard to wetland impacts, we understand that the acreage figures used are intended to be "worst case" and that impact figures may be somewhat lower after final design. However, both the Proposed Action and the Existing Channel Modification Alternative have large permanent impacts to wetlands and their resident wildlife. To help justify the adequacy of the proposed mitigation to the reader, the document should include the acreages of high functional-quality wetlands versus low-quality wetlands that will be lost. Impacts to the wetlands in reaches 7-9, including the mitigation wetlands for the Jordanelle Dam, are of particular concern. Our responsibility to the public to see that the impacts to wetlands from the construction of the Jordanelle Dam project are mitigated adds a special concern to our review of the impacts to Reaches 7-9. Impacts to wetlands from this project would be considerably reduced if the project did not include these reaches.

26.6 We also note that all of the proposed mitigation consists of enhancement of existing wetlands through the removal of livestock grazing and protection of the properties from development. Although enhancement of wetlands is sometimes used as mitigation for impacts to wetlands, enhancement is generally required on substantially more than a 1:1 acreage basis. If there are upland areas or open water areas within a property proposed for enhancement, only those areas that add to the value of the wetlands (for example, by providing a buffer), can be given credit as mitigation for wetlands. The document does state (page P 3-102) that the Mitigation Commission will seek opportunities to restore and create wetlands within the reconstructed floodplain as part of developing wetland mitigation plans during final design. We support the concept of seeking to mitigate within the general impact area of the project, with the minimum goal of at least replacing the functions of the lost wetlands.

26.4 Your comment does not specifically reference the page or section of the Draft EIS which refers to "...major changes in the proposed alignment and profile..." of the Proposed Action during final design. During final design, changes to the restored channel pattern and location are likely. However, the changes to final channel alignment are expected to be minor (on the order of several meters), and will lie within the Core Area. Adjustments to the channel geometry will also be minor. See Section 1.3 of Chapter 1 for an overview of the PRRP alternatives and Section 1.5 of Chapter 1 for a detailed description of the Proposed Action. The impacts quantitatively evaluated in the Draft and Final EIS represent a worst-case scenario in those instances where impacts could not be predicted precisely, and the analysis covered all anticipated impacts. Additionally, instream fish habitat structure technology has not substantially changed since 1991. However, if the Instream Structures Alternative is selected for implementation, it would undergo final review as would any of the PRRP alternatives, prior construction. Again, final changes, if any, are expected to be fully within the range of impacts analyzed by the Draft and Final EIS.

26.5 Thank you for your comment. We recognize that short-term construction impacts of the Proposed Action and Existing Channel Modification Alternative are substantial, but long-term benefits to this ecosystem will be significant. Under the No Action Alternative, this ecosystem will continually decline. The Mitigation Commission has committed to mitigate for all wetland impacts of the PRRP, including any impacts which may occur to the USBR constructed wetland mitigation area. The Mitigation Commission is cooperating with USBR and COE to assure that wetland mitigation requirements for Jordanelle Dam are achieved. The Mitigation Commission has also assembled an interagency/interdisciplinary group to determine measures to avoid or reduce impacts to wetlands, especially spotted frog habitats, under the Proposed Action. The recommendations of the Spotted Frog Advisory Team (see Appendix H) included several modifications that have been incorporated in the final Proposed Action described in the Final EIS that will substantially reduce impacts to high-value wetlands and associated wildlife in reaches 7, 8, and 9 (see also response to comments 3.11 and 3.13; Section 3.19.2 and Section 3.19.3 of the Final EIS; and Map A-5 in pocket at back of EIS).

26.6 Thank you for your comment. It will be considered in the final design and also in preparing an application for the Section 404 permit from the Corps of Engineers. Additionally, see Section 3.19.2 of the Draft and Final EIS, which describe the proposed wetland mitigation program and includes more than protecting existing wetlands. Table 1-1 and Figure 1-5 in Section 1.5 of Chapter 1 of the Final EIS describe the diversity of wetland sub-types that would be created within the floodplain under the Proposed Action.

26.7 In any event, careful monitoring will be needed of the various wetland areas, including riparian woodland, as they develop. If wetlands do not develop in quality and quantity at an acceptable rate, additional mitigation for temporal losses may be required.

26.8 The timing of impacts versus mitigation is also a concern, particularly in regard to the spotted frog. Spotted frog habitat is already seriously compromised in this area. The potential exists that loss of more habitat, whether for a few years from construction impacts or during the time replacement habitat is less than fully developed, might bring the population below viable levels. Measures to address the adverse impacts of the temporal loss of habitat should be addressed.

26.9 Finally, the DEIS includes as part of baseline conditions public angler access to this reach of the Provo River and maintenance of minimum instream flows of 125 cubic feet per second (cfs). It notes that these commitments have not yet been implemented, but does not state when they will be implemented. To assure the reader that these measures will indeed be in place before construction of any PRRP alternative, implementation dates should be given.

I hope our comments will be useful to you in the preparation of the FEIS. If you have any questions, please contact Ms. Michele Waltz, at the Utah Regulatory Office, 1403 South 600 West, Suite A, Bountiful, Utah 84010, telephone (801) 295-8380.

Sincerely,

for Brooks Carter
Chief, Intermountain
Regulatory Section

Copies furnished:

Mr. Dave Ruiter, U.S. Environmental Protection Agency, 8EPR-EP, 999 18th Street, Suite 500, Denver, Colorado 80202-2466
Mr. Harold Sersland, Central Utah Water Conservancy District, 355 West 1300 South, Orem, Utah 84058-7303
Mr. Reed Harris, U.S. Fish and Wildlife Service, Lincoln Plaza, 145 East 1300 South, Suite 404, Salt Lake City, Utah 84115
Mr. Ralph G. Swanson, U.S. Department of the Interior, 302 East 1860 South, Provo, Utah 84606-7317

26.7 The Mitigation Commission will monitor all riverine wetland types and associated wildlife to ensure that the project provides the required benefits (see Section 3.19.2 of the Final EIS for a description of the proposed monitoring plan.

26.8 Thank you for your comment. Please refer to comment responses 13.11 and 13.13.

26.9 Please see the first paragraph of comment response 22.08.

4.5.3 Public Hearing Comments and Responses

As shown on Table 4-1, 30 people addressed the PRRP Draft EIS in testimony presented at the two hearings. Each comment is presented, followed by the response.

4.5.3.1 Heber City, Utah July 16, 1996

Witness: Ren Provost

Comment 1: "Then I'd like to address the restoration of the Provo River and give you some of our comments, our wishes that there be no net loss of private ownership, that the river be kept within its present corridor. That would be alternative number two that we support."

Response: Thank you for your input. Your suggestions will be considered in the decision process in selecting which alternative to proceed with.

Comment 2: "Number three, that you address the huge impacts that you're putting on Wasatch County. In approximately 1960, we had 160,000 acres of private ownership in our valley. Today, and with this Provo River Restoration and Jordanelle, and this is not to mention the Snake Creek preservation that we just finished, we have 122,000. That's a loss of approximately about 38,000 acres of private ownership. And we think this is too much."

Response: The PRRP Proposed Action would require 490 acres of private lands, with up to another 198 acres possibly acquired, in order to implement this alternative. This is less than one percent of the remaining private land in Wasatch County. The PRRP alternatives would require less private land to implement and manage those actions. Please also see the revised Socioeconomic section (Chapter 3, Section 3.12) in the Final EIS for a discussion of the economic impacts on Wasatch County from implementation of the PRRP. This section was revised for the Final EIS using a model developed by the State of Utah, Governor's Office of Planning and Budget, for Wasatch and Summit counties.

Comment 3: "We'd like you to also address how we're going to pay for emergency services, police protection, garbage pickup, waste protection, and all other impacts that come to the county. As a county, we are committed to send quality water to the Wasatch Front. We have spent many years and many thousand of dollars cleaning up our streams. There has been many dairymen that has gotten off of the creeks, and we now are sending good water down there, and we want to continue, and we're afraid we're going downhill."

Response: The Draft EIS has been revised to address your concern. Please refer to Chapter 1, Section 1.4.2 of the Final EIS. In summary, the Mitigation Commission intends to develop an operating agreement with Wasatch County, Utah Division of Wildlife Resources and possibly other entities for management of the PRRP. This agreement will identify and commit sources of funding for operation, maintenance and management of the river corridor under baseline and PRRP conditions.

Comment 4: "I'm sorry to take more time, but there's a couple things that came to mind while I was sitting there. The County Attorney Dan talked about the AUN value, which is an animal unit to support one cow and one calf, and you said in your EIS that there would be 1,161 AUM losses in this project, which would amount to $8,420 -- which I'm quoting Dan again -- which would be $7.26 per AUM.

The real figure is -- and we just completed a study on the Forest Service -- the real figure is $232.55. Now, don't get me wrong. One cow doesn't create that. But when it goes into the community to the feed store, to the bank, to the auto parts store, wherever, it turns around that many times, that's the value, and that's $269,000, which -- and that's grossly wrong, which has to be corrected."

Response: Thank you for your information. The figure you quoted includes indirect effects of leasing an AUM. The base figure that was used per AUM was the amount that the Bureau of Land Management charges per AUM. Also please refer to comment response 9.22 for a more thorough discussion of the socioeconomic impacts of the PRRP.

Comment 5: "In another place you said you would generate $120,000, give or take, for Wasatch County. Now, I defy you to tell me where one penny of that will come to Wasatch County. Some of it will come back through sales tax to the cities, but Wasatch County has no take whatsoever in that."

Response: The Final EIS includes revised impact analysis on socioeconomics based on a regional model developed by the State of Utah Office of Planning and Budget for Wasatch and Summit counties. The direct and indirect economic impacts from each of the PRRP alternatives are described in Section 3.12 of Chapter 3 of the Final EIS. Please also see comment response H02-04.

Witness: Dan Matthews

Comment 1: "My first comment is regarding fencing of the river and the side channels. I believe the county opposes the fencing in as much as it interferes with the agricultural uses along the river.

My question is: What, if any, provisions are made for agricultural use along the river, such as livestock watering? Are we to assume that acquisition boundary, which is shown on Map A-5, will also be the fence line? And are there any of the alternatives, including the baseline, that don't require fencing of the entire Provo River corridor? I think there's not; that all of alternatives and the baseline condition that's included in this require fencing of the whole corridor.

I don't think that's made very clear in the document. Even your pictures are misleading, I think, because they show no fences on some of the pictures and cattle on here and streams on the side. I just don't think that's going to be the case. So I think clarification needs to take place on fencing."

Response: Please refer to the Summary, Section S.5.6 ; to Chapter 1, Section 1.3.2, and Section 1.4.1 of the Final EIS concerning impacts to agriculture due to fencing of the Project Area and provisions to address those impacts. As stated, the entire corridor will be fenced regardless of which alternative is implemented as this management measure will occur under baseline conditions. Please refer to Section 1.5.3.2, Section 1.6.3.2, and Section 1.7.3.2 for descriptions of land use and management, including fencing and agricultural practices under the Proposed Action and the PRRP alternatives.

Comment 2: "Third is that the method of land acquisition, I think that it needs to be clarified in here or described, the proposed method of land acquisition. If it's a willing-seller type thing, I think the county's opposition goes down dramatically. If it's condemnation, you heard the Commissioner just say that we oppose condemnation in any form. And I think you need to describe how that acquisition's going to take place.

I also think you ought to address whether or not the possibility exists that some of that land could remain in private ownership with the conservation-type easement, or whether it all has to be in Federal ownership along the entire river corridor."

Response: Two new concepts were added to the Final EIS to address the concerns about land acquisition procedures: the identification of a *Core Area* and an *Expanded Restoration Area*. The Core Area is composed of lands required to implement and manage the alternative. The Expanded Restoration Area consists of additional lands with potential for additional riparian or wetland developments, or for protection of wildlife habitats. All alternatives have a Core Area but only the Proposed Action includes an Expanded Restoration Area. The Expanded Restoration Area was identified in those areas where there are concerns over unusable islands or "uneconomical remainders" as a way of offering to acquire additional lands, on a willing-seller basis only, to accomplish additional ecosystem restoration or wildlife habitat protection objectives beyond the

Core Area requirements. Eminent domain would be used to acquire the Core Area, but only as a last resort. For more detail, please refer to Chapter 1, Section 1.3.2.1 and Section 1.3.3.1 in the Final EIS concerning acquisition of land procedures for the Core and Expanded Restoration Areas.

Comment 3: "My question, I guess, is who will have liability for any flood damage problems? I assume that the Provo River water users would not want that liability if their dikes are removed. So I think that issue needs to be addressed."

Response: Jordanelle Dam significantly reduces peak flood flows, as described in the PRRP Technical Report (CUWCD 1994), Section 3.4. The PRRP either includes acquisition for all areas affected by the post-Jordanelle 100-year flood, or construction of setback dikes, removing any flooding liability on those lands. Please refer to Map A-3 in the Final EIS which shows the 100 year flood line and area proposed for acquisition by the project.

Comment 4: "Also, I think you need to clarify whether or not the government plans on acquisition of additional flood easements beyond the boundaries on Map A-5. My understanding is that Map A-5 shows land acquisition, and I also understand from the document that there might be additional flood easements beyond that boundary. And so that needs some clarification, I think."

Response: The areas to be acquired have been modified. Please see Chapter 1, Sections 1.3.2 and 1.4.1, and Map A-3 in the Final EIS. There will be no additional flood easements purchased for the PRRP Proposed Action or any alternative.

Comment 5: "Finally, I think there is a small paragraph in a couple places about baseline condition. But I think there's a general misunderstanding among county officials and perhaps the public as to what exactly you're counting as baseline. My understanding is that the baseline is not as it exists today, but includes the new access points, includes fencing, and fisherman access up and down the river, and I think that needs to be clarified."

Response: Baseline conditions for some resources are not the same as they exist today (i.e. June 1996). The difference between existing conditions and the baseline is explained in several different places in the Draft EIS. The second paragraph under section 1.3, page P 1-2 of the PRRP EIS states that certain commitments made in the Final Supplement to the Final Environmental Statement for the Municipal and Industrial System EIS will be implemented regardless of a decision to implement the PRRP Proposed Action or any of its alternatives.

Section 3.1.2 Existing Conditions Versus Baseline which is found on page P 3-3 of the Draft PRRP EIS goes into more detail about the differences between conditions which exist today (1996) and the conditions that are expected to exist and were used as baseline. Table 3-1 in this section clearly shows the quantified differences between existing conditions and baseline conditions that are expected to occur regardless of implementation of the PRRP Proposed Action or any of its alternatives.

Each resource topic (e.g. water resources) which follows Section 3.1.2 also provides a brief description of the baseline conditions which were used in determining impacts of the Proposed Action and alternatives.

In addition the Draft EIS has been modified to further clarify baseline conditions. Please refer to Chapter 1, Section 1.4.1 Implementation of Baseline Conditions for the Provo River Corridor, in the Final EIS.

Comment 6: "One last thing, and that is -- well, two last things. One is you have eliminated from further consideration the human waste problem, and I think that's a mistake. If you go to the lower Provo, there's a real problem there."

Response: Please see comment response 9.20.

Comment 7: "And last week your AUM calculation was grossly understated. You've got it at about $6 or $7. We calculate more like $230. So your value is way low, and we think the impact you've got in here is absolutely ridiculous."

Response: Please see comment response 4 for Ren Provost.

Witness: Mike Spanos

Comment 1: "From a law enforcement point of view, I concur with what our County Attorney has said, what Commissioner Provost has said, and we would like you to take into consideration we just cannot handle any more recreation in this county, nor do I think our citizens need to have any more of their land taken."

Response: Thank you for your concerns about law enforcement in the county. The Draft EIS has been modified and clarified on the point of management responsibilities. Please refer to Chapter 1, Section 1.4.2 in the Final EIS.

Witness: Beverly Evans

Comment 1: "You go back and you find the search and rescue and the budget, and we look at the issues that are there and the type of impact that you have, and you continually go back to bring this impact on the county. I think that's something that has to be evaluated and assessed. "

Response: Please refer to comment response 3.8.

Comment 2: "And I think as you look at the planning of this riverway and the development, that you must, I think, have a moral obligation that you look at the impact and the feelings of this county and the type of tax burdens that you're again putting back on them, and the type of maintenance they have to maintain without a tax base. You continually have everything from debris pickup to law enforcement and so forth, on an area that they don't have any economic benefit."

Response: Please refer to comment responses 3.8 and 3.12.

Witness: Bill McNaughtan

Comment 1: "I'd like to just echo the feelings that have been presented here that we have enough playground in Wasatch County, that we don't need any more. I would take a young man raised on a farm, which you propose to destroy, and lay him against any person raised on the best playground you can provide. I again would just echo that I don't see anything in this Environmental Impact Statement that indicates anything than that we are going to ignore the concerns and the welfare of Wasatch County, of the citizens that live along that river and own the property there, and we are going to press forward and satisfy the larger demand."

Response: Thank you for the concerns you expressed. The EIS is not used to present a decision. It forms one part of the decision making process. The concerns expressed by yourself and others will be considered in the decision making process.

Witness: Ray Hult

Comment 1: "So meandering the river in a ground taking is one thing. If it's going to be managed by the parks that feel they have to have total park availability, then we -- and I know that's not the issue. But I'm really concerned about management, so I think we're entitled to receive some explanation on what the plans are for management. Is there a parkway in the mill? Because that is going to be as major an impact on all of us as the restoration of the river. That's all I have to say."

Response: Please refer to comment response 3.12 and Chapter 1, Section 1.4.2 in the Final EIS for a clarification on proposed management responsibilities and possible funding sources.

Witness: Joe Morgan

Comment 1: "All right. I guess it's not a rhetorical question that I have. It's a real question. The question in my mind is how bad is the Provo River right now as a fishery? Is it a good fishery? It seems to me that the Provo River and the Heber Valley, a lot of fishermen --"

Response: The Provo River in the PRRP Project Area is not considered a good fishery under existing conditions. Please refer to Chapter 3, Table 3-1 in the Draft EIS which shows the existing condition and predicted baseline condition for trout. The predicted increase for the Proposed Action and PRRP alternatives in fishery values (especially trout) has been revised in the Final EIS. Please see Chapter 3, Section 3.5, Table 3-22, in the Final EIS.

Witness: Darwin McGuire

Comment 1: "Nowhere and at no time are the landowners considered as far as whether or not the corridor is going to be taken. It is arbitrarily being taken by big government to provide recreation for people not in this county that don't pay the taxes and don't bear the cleanup costs, and don't bear any of the costs associated with it to come up here and catch some fish."

Response: The concerns of landowners have been considered throughout the planning for the PRRP (see Section 4.2 and 4.3.2 in the Final EIS) and their concerns will be considered in the decision making process. Section S.3.1 in the Summary of the Final EIS describes changes to the acquisition requirements of the Proposed Action based on public input. See Section 1.3 of the Final EIS for more detail on land acquisition requirements and procedures, and Section 1.4.2 for more detail on management responsibilities for the Provo River corridor.

Witness: Lynn Baum

Comment 1: "Private ground in Wasatch County, and particularly this agricultural ground, is being lost at an alarming rate. Prior to 1987 this property totaled nearly 3,000 acres, and approximately 1,000 acres was lost to the Jordanelle Reservoir and associated mitigating wetlands in around 1987. Now there's only about 2,038 acres of this prime and unique agricultural ground that now remains."

Response: The PRRP Proposed Action would require 490 acres to implement and manage, including 203 acres of irrigated agricultural lands. Up to 198 additional acres could be acquired, including 18 acres of irrigated agricultural lands. This total (221 acres) represents less than one percent of irrigated lands in Wasatch County. Please refer to Section 3.11 of the Final EIS for a detailed analysis of the impacts of the PRRP alternatives on irrigated and non-irrigated agriculture. Please also refer to comment response H2.02.

Witness: Grant Kohler

Comment 1: "I happen to be from another situation when I worked with Wasatch County Search and Rescue, and just for people's information -- and correct me if I'm wrong, Johnny -- but over 90 percent, and it may be higher than that, I think, but 90 percent of the searches we go on are people who are from the Wasatch Front or not of our county. It's not people here that have the problem, it's people who come in. Who pays that? Who pays the burden?

And I don't think the people who want this recreation sitting on the other side of the Wasatch Front have dealt with the problems of: What impact does it have? How are we going to work those impacts out? And what can we do to maybe minimize that impact?"

Response: Please see response to comments 3.08 and Ren Provost comment 3. Section 1.4.2 of the Final EIS also addresses this concern.

Comment 2: "And I have a strong concern that we're not being heard; that all these years that we've talked and the hours and hours and hours we've spent, that you do just what you want. That you don't listen to us, and we never have heard any real feedback. And my thing is I would like to have some feedback. I'd like to hear you guys come back and explain some of these things to us and explain what good all those hours we have done for the last 15-plus years are in trying to work something out."

Response: The Proposed Action has been modified based on public input to include a Core Area and Expanded Restoration Area. Please refer to Section S3.1 of the Summary for an overview of this change, or Section 1.3.2.1 for a more detailed description. Please also refer to response to comment H3.02.

Witness: Darrell Mensel

Comment 1: "I think the fishing industry and the recreation industry is a bigger industry and is going to have a larger role to play in the Heber Valley in the future, although I do hope the cows find a way to stay. I think that, and I haven't analyzed it yet as closely as I might, but I hope they find a way, perhaps, to allow cows to, you know, take as much space as they can in the easement. They don't get in the way of the fishermen."

Response: Please refer to Chapter 1, Section 1.3.2, and 1.4.1 in the Final EIS concerning fencing of the Project Area and access to water by adjacent livestock operators.

Witness: Chuck Daley

Comment 1: "The thought of maintaining the project at $6,000 a year forever, who's going to pay for that? You know, as Grant said, I don't think that's a realistic number."

Response: Maintenance costs presented in the Draft EIS have been revised. Please see Chapter 1, Section 1.4.2, and Table 1-17 in the Final EIS for a discussion on management responsibilities, possible sources of funding, and estimated project costs.

Comment 2: "The EIS did not address the vehicular traffic. It talks about 70 trips a day during construction. Six years doing what? Huge ten-wheel dump trucks running up and down 113 River Road 40 for six years?"

Response: The transportation impacts of construction traffic were analyzed in the Draft EIS. Please see Chapter 3, Section 3.18.

Comment 3: "Listen to what the constituency and the owners of this community are saying, and please, follow and do the nothing option in this EIS."

Response: Thank you for your comments and input. Your concerns will be considered during the decision making process.

Witness: Wes Jones

Comment 1: "Let's talk practical. Why hasn't it been mentioned by the EIS and others what they're going to do in this respect? For instance, are they going to put up a six-foot chain link fence with locked gates for the farmers, to protect their land? And I see no reason to have a toilet every 100 feet, and facilities every 100 feet in an area that's trying to be preserved as a wilderness for the fishermen and for the people who want to utilize it. I second this last gentleman's word so strongly in that regard."

Response: The Draft EIS has been revised concerning the type of fencing. Please see Chapter 1, Section 1.4.1 of the Final EIS.

Concerning the placement and number of access points and sanitary facilities please see Chapter 1, Map 1-1 and Section 1.4.1 in the Final EIS. Only seven access points and associated facilities will be developed along a ten mile stretch of river.

Witness: Wayne Thacker

Comment 1: "Now Jordanelle is there and Deer Creek's below us. Jordanelle will be full at one time. The spillway will be complete and will be necessary, and at that time you will not control that water. It will be beyond your control, and it will not follow the meandering stream that you have developed. One, who is responsible? Well, it's out of bounds. It shouldn't be out of bounds. But someone has got to be accountable, because man has changed things around."

Response: Please refer to comment response 3 for Dan Matthews.

Comment 2: "Secondly, this gentleman who likes to fish in Montana, he ought to paint the real picture. If those fisheries were profitable in Montana, it's because the landowner is deriving the funds generated by the fishing. And let's let the Wilsons and the Kohlers, those others along that river, have those funds, generate them themselves, and they may be more profitable than cow farming. I agree with that."

Response: Thank you for your comment. Please refer to a Section 3.12. In Chapter 3 of the Final EIS which discusses economic impacts from increased recreational tourism under the Proposed Action and the PRRP alternatives.

Comment 3: "We ought to be aware that the people in this valley have had about all we can handle in that kind. It's not the place we grew up. We're unhappy with it, and at that time, yes, it will be subdivided, when Grant Kohler and the Wilsons and these people say, I've had enough. Then those that have come in and enjoyed this pristine lifestyle will see it change dramatically.

I hope this will be addressed in your -- I don't know where this is going, but I hope I, too, might be seeing something come back."

Response: Thank you for your comment. These impacts were discussed in the Draft EIS in Chapter 3, Section 3.12.6.3.10 (Social Impacts). Chapter 3, Section 3.12.6.3.10 has been revised in the Final EIS based on the use of a regional impact model developed by the State of Utah Office of Planning and Budget for Wasatch and Summit counties.

4.5.3.2 Salt Lake City, Utah July 17, 1996

Witness: Beverly Evans

Comment 1: "Number one, we have a study that talks about the ecological and environmental impact, but in that study we do not have any reference to the demographic, economic and social impact on a community such as -- or in Wasatch County."

Response: Social, economic and demographic impacts were adequately analyzed in the Draft EIS. Please also refer to response to comment 3.7.

Comment 2: "The second issue is there needs to be an impact study done on the financial responsibilities of Wasatch County. Number one, who's going to be responsible for the management and the control of the Provo riverways as proposed?"

Response: Please see response to comment 3.8.

Comment 3: "Number two, who provides the maintenance and operation for the maintenance of this type of facility? Who provides the law enforcement and who also pays for the litigation --"

Response: Please see comment response 3.8.

Comment 4: "Number three, what about the protection of the private property rights, trespassing, the damage to private property owners and the protection for access that most private property owners need to have designated and that's not addressed in the study that we have?"

Response: Please see comment response 3.9.

Comment 5: "Number four, what type of coordination with existing studies do we have, for example, in trail development? The State of Utah has five different studies that have gone into trail development within Wasatch County within the state regions, and we need to have some coordination with those exiting studies on what type of trail development and how that coordinates with the study that is referenced in here."

Response: Please see comment responses 3.5 and 3.12.

Comment 6: "Number five, we need to identify what type of partnerships we have with Wasatch County. Who's been involved, who's represented the positions and the viewpoints of the residents of that county?"

Response: Please see comment responses 3.5.

Comment 7: "Number six, we need to have input from representatives from Wasatch County throughout the entire process. We have known for years, as was alluded to, that we were going to have this type of proposal come forward. We've had numerous meetings in Wasatch County. There's been major input from the residents, and yet we do not have any reference as to how that's been treated, any verification of their consideration, their testimony and their concerns of the type of impact on their county."

Response: Please see comment responses 3.5.

Comment 8: "Number seven, what type of native impact is it going to have on the taxpayers of Wasatch County and what type of assumptions are we making that they're going to have to pick up some of the costs of this type of endeavor?"

Response: Please see comment responses 3.7.

Comment 9: "Number eight, what type of process has been considered to make certain that the residents of Wasatch County have been heard?"

Response: Please see comment responses 3.5.

Comment 10: "And again, a recommendation coming forward that I present is that we have a committee with Wasatch County as a partner in this process; that they're fully represented as we go forward; that if indeed we're trying to build a partnership impacting the county dramatically that this proposal, these proposals do, that Wasatch County needed to be represented and make certain that their issues are presented forward."

Response: Please see comment responses 3.8.

Comment 11: "What type of coordination have you done with the State Engineer and Water Resources?"

Response: Please see comment response 3.5.

Witness: Paul Dremann

Comment 1: "Despite repeated requests to do so, we have attempted to get the language in the EIS, Draft EIS that this passage is an integral part of any restructuring or rebuilding of those diversions. And it should be mandated also the 125 cubic feet per second is a requirement of the project, and not necessarily, I don't believe it's a part of the EIS. It has to be done regardless of whether the EIS goes through or whatever. If this passes, it's a very necessary integral part of that, and I'd appreciate that that language be placed back in the file EIS."

Response: Please refer to comment response 6.2.

Comment 2: "Another issue on that is the Fishery Management Plan. I was privileged to take a tour of the river a few years ago with a few gentlemen that dealt with restoration there. They're part of the peer review group. And the comment was made by them to those present of basically how did you design a river? How can you plan for a redo of the river when there is no plan, when there's no target? Where's your fishery management plan? What are you designing to?

I think that even though it's under the realm of a state agency, I believe that some references to or language regarding the fishery management plan should be put in the EIS so that you know what all its design addresses."

Response: Please see comment response 6.5.

Witness: Dan Potts

Comment 1: "My comments will probably be summarized by saying that number one, there's a fairly poor utilization of existing features of the existing channel and other features in the flood plane."

Response: Please refer to comment responses 20.5 and 20.17.

Comment 2: "And another comment is the arbitrary use of side streams and ponds. It's almost as if they were plunked down as an afterthought, which I hear might have been the case. And with regard to the side streams, it's evident to me that existing side streams and some insinuous irrigation canals have been left out of consideration, and even though I've repeatedly requested why, I've yet to receive any kind of rationale or comment as to why the west side ditch or Birkenshaw Creek were left out of consideration as side channels or side ditches of the Provo River."

Response: Please refer to comment responses 20.2 and 20.18.

Comment 3: "Probably the last comment on Provo River Restoration is that there's one section that has not been channelized that we refer to as the braided-out section. And quite frankly that section immediately above the Midway Bridge in the last year-and-a-half has recovered amazingly. And so it's our recommendation and anybody else who walks that stretch I'm sure would recommend that that stretch be left alone entirety and that the landowners and that stretch being dealt with on an easement basis."

Response: Please see response to comment 6.9.

Witness: Mike Spanos

Comment 1: "And I think that the action that you need to take is the no-action on this situation."

Response: Thank you for your comment. It will be considered in the decision making process.

Witness: Marjorie Baum

Comment 1: "However, you also show that your flood plain, with a two-foot high dike and about 10 or 12 feet wide, creates wetlands also. And then there's the construction easement that would add another 20 feet or so beyond that, encroaching on our farm.

And since your edition of the latest EIS report, you have acquired all of Bernard Walker's farm west of the Highway 40, the new one, and clear across the Provo River to the mountain. Now, that whole place, 64.69 acres, has been designated as wetlands and nobody seems to know what I was talking about in Wasatch several week ago. But it's plain as day right here on your map."

Response: Subsequent to your comment, Mitigation Commission staff met with you to discuss your concern. The shaded area you referred to on Map A-9 in the Draft EIS indicated that property acquired by the Mitigation Commission north of your property could potentially be developed as wetland mitigation areas. There is currently no plan to develop wetlands on the east side of the Provo River on the subject parcel north of your property. The concern expressed at the hearing is therefore not going to occur. In addition, Mitigation Commission staff and Bureau of Reclamation staff have met several times on-site with your son to discuss this and related matters. The Mitigation Commission continues to discuss these matters with you and will assure there are no impacts from flooding of adjacent properties to your remainder property from the PRRP.

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Glossary

100-Year flood. A flood that occurs, on average, once in 100 years and has a 1 percent chance of occurring in any given year.

Accretion. The gradual accumulation of water in a surface or subsurface body of water.

Acre-feet. A unit of measurement of volume of water, equivalent to an acre of water 1 foot deep.

Affected environment. Parts of the environment that would be impacted by a change in operation or management.

Agricultural practices. The procedures used to produce crops, including such operations as planting, fertilization, pesticide application, cultivation, irrigation and harvesting.

Algorithm. A mathematical formula using several variables or attributes.

Alluvial soils. Soils formed by flowing water.

Alternative. A proposition or situation offering a choice between two or more proposals, only one of which may be chosen. An opportunity for deciding between two or more courses or propositions.

Angler day. One person fishing for 2.6 hours.

Animal unit month (AUM). The amount of feed or forage required by one animal for 1 month, which is equivalent to the average monthly forage consumption of 800 pounds of dry matter.

Aquatic ecosystem. Waters of the United States, including wetlands that serve as habitat for interrelated and interacting communities and populations of plants and animals.

Aquifer. A subsurface body of water.

Arachnids. Class of arthropods containing spiders, mites, ticks and scorpions. They have no antennae, and the front half of the body bears four pairs of legs.

Attribute. A characteristic of the aquatic habitat (e.g., late summer streamflow and eroding channel banks) that is given a numerical rating based on a field evaluation. The rating is used to compute a score using the Binns HQI (Habitat Quality Index) model (see description below).

Avulsion. A sudden, natural change in river alignment that occurs most often when major flood flows break through channel banks and flow into lower areas.

Background distance zone. The distant part of a landscape, picture, etc.; surroundings, especially those behind something and providing harmony or contrast; surrounding area or surface. Area located from 3 to 5 miles to infinity from the viewer.

Backwater. A hydraulic (flowing water) habitat type that is characterized by slackwater on the downstream side of meander bends.

Bankfull. Water flowing in a channel at the elevation of the channel banks. Any additional discharge would cause water to begin overflowing from the channel.

Baseline. The set of starting conditions from which changes and impacts are quantified.

Bed load. Material (e.g., sands, gravels and cobbles) transported by flowing water that moves and interacts with the channel bed.

Benthic macroinvertebrates. A group of small aquatic insects, crustaceans and worms typically found in the substrate (mud, sand, silt, gravel, cobble and boulders) of a stream or body of water.

Binns HQI Model II. A method of calculating a score that measures existing stream habitat quality for trout and estimates potential trout production resulting from improvements in habitat quality attributes.

Biomass. A measurement of the weight of living organisms per unit area.

Bluff pool. A deep pool formed where the channel impinges at a high-angle on a bedrock bluff.

Buffer. Space adjacent to the channel or other project feature where activities that could adversely impact the feature would be restricted.

Calibration (of a model). The process of adjusting simulation model parameters to more accurately mimic the prototype system.

Capital program. A plan of a government agency or other entity to spend money in the future, usually for physical facilities such as utilities, buildings, streets and roads.

Carrion. Decaying remains of an animal.

Channel geometry. Physical characteristics of the channel cross-section (bottom width, top width, depth, side slopes).

Check dam. A structure placed in a stream or water conveyance facility to control the hydraulics of the flow.

Chute. A hydraulic (flowing water) habitat type that is characterized by concentrated and confined high velocity flow that occurs over a short, steep channel segment.

Cofferdam. A temporary dam or diversion structure formed in the channel to isolate certain areas and keep them relatively dry during construction.

Community well-being. A term used in social impact assessment to describe how satisfied or happy the members of a community are. A community's well-being is influenced by the overall level of conflict between the community's social groups and can be affected by impacts on its members' lifestyles, behavior, attitudes and values.

Colony. A group or cluster of individuals of a species living together.

Complexity. The diversity and variability in stream habitat; the presence of different kinds of structure in a stream (e.g., root wads, logs, cover and depth) that contribute to increased habitat diversity.

Condemnation. A legal process involving the acquisition of private property by a government agency.

Conductivity. A measurement of the degree to which a body of water transmits an electric current.

Confluence. The location where two or more streams come together.

Contingent valuation. A methodology for measuring the dollar value of a particular resource, usually environmental benefits. A useful way to measure intangible benefits of a project, it often involves conducting a survey to identify the value placed on a resource by a target group. The surveys are used to measure the amount of money individuals would be willing to pay in return for a given quantity or quality of that resource over a specified period of time.

Control structure. A structure placed in a stream or conveyance facility to control the hydraulics of the flow.

Conveyance losses. The portion of the flow through a conveyance facility that does not reach the delivery point.

Core Area. Lands required to implement and manage the Proposed Action and alternatives to meet the project needs.

Council on Environmental Quality (CEQ). An advisory council to the President of the United States established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Creel census. A determination of fish catch success based on interviews with anglers.

Cross drainage. Surface flow from rainfall, snowmelt or irrigation drainage that flows across or enters irrigation facilities.

Crop yield. The amount of harvest per acre for a particular crop for 1 year.

Crustaceans. A large subphylum (or class) of arthropods typically having two limbs and two pair of antennae (e.g., crabs, lobsters and shrimps).

Cumulative impacts. As defined in Section 1508.7 of the Council on Environmental Quality (CEQ) Regulations (CEQ 1978), cumulative impacts are "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

Decibel. A unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to 130 for the average pain level.

Delivery rate. The volume of water delivered per unit of time.

Depositional structure. A rock or log structure placed in a channel to encourage bed material (sands, gravels and cobbles) to drop from flowing water and be deposited in selected locations.

Diversion dam. A structure across a main river channel that maintains the channel bottom elevation and increases the water surface elevation just downstream of a diversion structure to improve the performance of the diversion.

Diversion. Taking water out of a stream and putting it into a pipeline, canal or reservoir.

Dominant species. A plant species that exerts a controlling influence on or defines the character of the plant community.

Dynamic equilibrium. The self-regulating state of a physical system wherein negative feedback counteracts the effects of external change so the system returns to a state of equilibrium.

Easement. A partial ownership of land providing the owner access or other rights to certain uses of the parcel.

Ecosystem. A community of animals and plants and their interrelated environment.

Edgewater. A hydraulic (flowing water) habitat type where flow velocity is relatively slow and water depth is shallow.

Effectiveness. The capability of a wetland to perform a function due to its physical, chemical and biological attributes. Effectiveness does not estimate the magnitude of a wetland function, but the probability that a wetland will perform the function.

Elements (of a model). Homogeneous units of aquifer material represented in the model.

Emergent marsh. A meadow-like area overgrown with herbaceous aquatic plants such as cattail, rushes and sedges.

Emergent vegetation. Erect, rooted, herbaceous vegetation (excluding mosses and lichens).

Eminent domain. The right of the government to take private property for public use, with just compensation provided to the owner.

Emission. Substances discharged into the air (as by automobiles or construction equipment engines).

Endangered species. Any species of plant or animal that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

Environmental Impact Statement (EIS). A document that discusses the likely significant impacts of a proposal, methods to lessen the significance of impacts, and alternatives to a proposed action. This documentation is required by the National Environmental Policy Act.

Equilibrium temperature. The temperature that a body of water would reach if all meteorological conditions were constant over time.

Erodibility. The susceptibility of a land surface to the carrying away of soil material by wind or water.

Eutrophication. The process of over-enrichment of water bodies by nutrients often typified by the development of algae blooms.

Evapotranspiration. Loss of water from the earth's surface to the atmosphere through the processes of evaporation and transpiration (movement of water from the soil through plants to the atmosphere).

Expanded Restoration Area. Lands adjacent to the Core Area that provide additional opportunities for habitat restoration and protection.

Fee title acquisition. Acquiring total, unrestricted ownership of a parcel of land.

Filter strip. A relatively narrow area of vegetated land that filters out suspended solids or other water quality parameters.

Fiscal resources. The funds of federal, state and local agencies, including revenue from various tax sources, that is used to fund public goods and services. These often include sales, use, property and income taxes. They may also include measures of the ability to borrow money or obtain grant funds.

Floodplain. The area covered by floodwaters from channel overflows; generally associated with a particular recurrence interval (e.g., the 100-year floodplain is the area covered by floodwaters from the 100-year flood).

Flow-weighted mean concentration. Average concentration of a pollutant in a stream or river, adjusted for the effects of flow.

Forewater. A hydraulic (flowing water) habitat type that is characterized by slackwater on the upstream side of some river bends.

Functions. The physical, chemical and biological processes or attributes of a wetland regardless of their importance to society.

Gage. A measuring device or location usually associated with water levels.

Game species. Any species of wildlife or fish that have seasons and prescribed bag limits and are normally harvested by hunters, trappers and anglers under state or federal laws, codes and regulations.

Geomorphology. The study of how various land forms are sculpted by surface agents such as wind and flowing water.

Geotextile. Fabric used in construction applications for separation layers, load-bearing increasers, filters, impermeable layers, soil retention and weed control.

Gradient. The slope of a streambed or groundwater level.

Grazing patterns. A system of livestock grazing management that includes the following approaches: 1) rest-rotation, in which grazing is deferred on various parts of the range during succeeding years, allowing those areas to rest for one year; 2) rotational, which uses periods of heavy pasture stocking followed by periods of rest during the same season; and 3) strip grazing, which confines animals to an area of forage to be quickly consumed.

Gross revenue. Receipts from economic activity before adjustments for taxes and the cost of doing business.

Groundwater. Water beneath the surface that feeds wells and springs and maintains the level of rivers and lakes in dry weather.

Groundwater discharge. The movement (usually laterally or upward) of water from a body of groundwater to its emergence into a surface water system such as a spring, seep or stream channel.

Groundwater recharge. A condition in which the volume of water entering underlying terrestrial environments exceeds the volume discharging to the wet depression on a net annual basis.

Growing season. The portion of the year when soil temperatures at 19.7 inches below the soil surface are higher than biologic zero (5° C) (U.S. Department of Agriculture — Soil Conservation Service 1985); approximately the number of frost-free days (U.S. Department of the Interior 1970).

Growth-inducing forces. Factors that can cause growth or economic development, including employment opportunities, affordable housing and land, plentiful resources such as water and energy, and favorable zoning and tax policies.

Habitat. The place or type of site where a plant or animal naturally or normally lives and grows.

Headcut. A nearly vertical drop along a stream or canal that tends to erode upslope.

Health and safety hazard. Something that could harm people or is a danger to the health and safety of people.

Historic archaeological site. Historic manifestation of human activity such as foundations and trash scatters.

Historic standing structure. A historic standing building with walls and roof still intact; also intact engineering structures such as bridges and culverts.

Hobby farms. A term used to describe farms that are usually small and not the primary source of income for their owners

Hydrology. A science dealing with the properties, distribution and circulation of water.

Income. A standard gauge of economic activity that measures personal earnings generated by workers before any adjustments for taxes or other costs of living.

Infiltration. The movement of water into the soil surface.

Ingress and egress. The movement of workers and equipment into and out of the construction area.

Instream flow. The volume per unit of time (often cubic feet per second) of water flowing within a stream channel.

Instream structure. A mechanical modification to a stream or river where logs or rocks are placed to create sportfish habitat.

June sucker. A threatened fish species found in the lower Provo River.

Jurisdictional wetlands. Wetlands that meet federal criteria for hydrology, soils and vegetation and are regulated by the U.S. Army Corps of Engineers.

Kilowatt hour. A unit of energy equal to 1,000 watts for one hour.

Land use. The types of activities allowed on land (e.g., agriculture, residences and industry). Certain types of pollution are often associated with certain land uses, such as sedimentation from construction or farming activities.

Laterals. Smaller ditches or canals off of a main canal, which carry water to the fields.

Lateral pool. A pool that develops at channel bends where the stream impinges on alluvial sediment.

Long-term impact. A general term used to describe impacts that continue after completion of project construction. The length of time they continue can vary.

Low flow. The annual minimum flow observed in a stream.

M & I (municipal and industrial) water. Water provided for urban land uses such as residential, commercial and industrial as opposed to agricultural.

Macroinvertebrate. Animals in a stream that lack a backbone and typically consist of aquatic insects, worms and other small animals that are large enough to see with the unaided eye.

Mapping unit. A common characteristic of soil, vegetation or hydrology that is used for mapping existing wetlands within the impact area of influence.

Meander. A bend in the channel alignment of a river or stream.

Mesotrophic. A lake or reservoir classification with moderate nutrient inputs and moderate algae production.

Middleground distance zone. The space between the foreground and the background in a picture or landscape. The area located from one-quarter to one-half to three to five miles from the viewer.

Migratory. An animal that shifts from one habitat to another by season.

Millimho (mmhos). A unit of electrical conductance.

Mitigate, mitigation. Cause to become less severe or harmful; reduce impacts; actions to avoid, minimize, reduce, eliminate, compensate, or rectify impacts to resources.

Mixing status. The frequency of complete vertical lake or reservoir mixing (i.e., dimictic mixes twice a year, while polymictic mixes several or more times per year).

Mixing zone. A limited volume of water serving as a zone of initial dilution at the location of a discharge point where receiving water quality may not meet water quality standards.

Mollusks. *Mollusca*, a phylum of unsegmented, generally shelled and bilaterally symmetrical invertebrates with a muscular foot for digging, swimming or creeping (e.g., snails, mussels, etc.).

Monitor. To systematically and repeatedly measure conditions in order to track changes.

Morse Decree. A 1921 legal decision that established water rights for irrigation diversions in Heber Valley, Utah.

Mulch. A protective covering spread or left on the ground to reduce evaporation, maintain even soil temperature, prevent or reduce erosion, control weeds and enrich the soil to enhance establishment of vegetation.

Non-jurisdictional wetlands. Wetlands that do not meet federal criteria for hydrology, soils and vegetation and are not regulated by the U.S. Army Corps of Engineers.

Noxious weeds. A plant species that is undesirable, conflicts, restricts or otherwise causes problems with intended land-use goals and objectives.

Nutrients. Essential chemicals needed by plants or animals for growth and health. If other physical and chemical conditions are optimal, excessive amounts of nutrients can lead to degradation of water quality by promoting excessive growth and accumulation and decay of plants, especially algae. Some nutrients can be toxic to animals in high concentrations.

Obstruction pool. A pool created by scour from water turbulence as it flows past an obstruction (i.e., logs, roots or rocks) in the river channel.

Open-water. Open-water wetland classification includes water of any depth with at least 7 linear feet and 49 square feet of surface area and no upright vegetation. If adjacent vegetation is mostly woody, the surface area requirement increases to 200 linear feet and 2,000 square feet. Open water includes channels, deep water, and wetland areas with submerged vegetation.

Organic riprap. Organic material used to prevent channel bank erosion (e.g., tree trunks, root wads and willow stakes).

Palatability. Agreeable to the sense of taste.

Passerines. Song birds.

Peak annual gross revenue. The largest amount of gross receipts expected to be generated during a 12-month period, typically used to gauge economic impacts caused by the peak workforce during construction of a project.

Peak annual income. The largest amount of earnings expected to be generated during a 12-month period, typically used to gauge economic impacts caused by the peak workforce during construction of a project.

Peak discharge. Maximum flow rate, usually reported in cubic feet per second (cfs).

Per capita income. A measure of how much money is earned on average by each person in a given geographic area such as a county or state.

Percolate, percolation. The downward movement of water through soil.

Permanent impact. An impact caused by construction of new facilities or project features that will not be removed during the life of the project (e.g. land removed from some current use and covered by a canal, pump station, river channel, etc.).

Phreatophytes. A plant with a deep root system that obtains water from the groundwater or the capillary fringe above the water table.

Piciformes. Woodpeckers.

Pollination. To place pollen on the stigma of a flower.

Pollutant loadings. The mass of a given pollutant that enters a body of water in a specified time period (i.e., kilograms per year).

Polarization. A term used in social impact assessment to describe the separation of social groups or members of a community, or an increase in conflicts between social groups or institutions.

Pool. A hydraulic (flowing water) habit type that has relatively deep water and slow flow velocity.

Pour-over. A local channel feature comprised of boulders or large cobble, usually in a riffle or rapid, which causes water to "pour over" and undergo a short, relatively sudden drop in elevation.

Prehistory. The study of the life and activities of mankind up to the beginning of recorded history.

Prey. An animal or animals seized as food by another animal.

Prime farmland. Lands that have the best combination of physical and chemical characteristics for the production of food, feed, forage, fiber and oilseed crops. Prime farmlands in Utah are defined to have the following characteristics; 1) a water supply adequate to meet 7 of 10 years irrigation requirements; 2) summer soil temperatures warmer than 59 degrees F at a depth of 20 inches; 3) a pH value between 5.5 and 8.6 above a depth of 20 inches and alkali content less than 15 percent; 4) a water table that does not restrict the production of food, feed and forage crops; 5) no significant salt content in the upper 20 inches; 6) no flood hazard nor flooding more than once in two years; and 7) minimal erosion danger (SCS 1983).

Productivity. A measure of how much of an agricultural commodity is yielded by agricultural land; (biological): a measure of how much of a biological resources is yielded by.

Project Area. Is composed of the Core and Expanded Restoration Area and differs between the Proposed Action and each alternative.

Projectile points. Pointed projectiles usually made of chipped stone, used 10,000 years ago as spear points and more recently as dart and arrow points.

Proposed Action. The proposal or proposed project by a lead agency in an environmental impact statement.

Rapid-pool channel. Similar to a step-pool channel but with rapids rather than steps to generate most of the drop in channel elevation.

Raptor. A bird of prey.

Reach. A defined length or segment of a stream.

Real-time monitoring. Instantaneous receipt of information from a remote site that represents what is occurring at the time.

Reclamation. Returning disturbed land to a form and productivity that is ecologically balanced and in conformity with a predetermined goal and land-use objective.

Record of Decision. A document separate from but associated with an Environmental Impact Statement that publicly and officially discloses the responsible official's decision on which alternative assessed in the Environmental Impact Statement to implement. It also includes commitments to mitigation.

Recurrence interval. Frequency with which a flood event would occur, measured in years (e.g., a flood with a 100-year recurrence interval would occur on average once in 100 years).

Regulating pond. A pond used to provide a more uniform water level or downstream flow of water.

Rehabilitation. Restoring an area or structure to its previous condition.

Reproductive success. The ability of two animals of the same species to produce fertile offspring.

Retention coefficient. A coefficient without dimension that reflects the annual fraction of total phosphorus sedimented or retained in a lake or reservoir.

Return flow. The flow of unconsumed water back to the stream, river or reservoir after delivery; often used to describe groundwater discharge to surface water.

Riffle. A hydraulic (flowing water) habitat type that is characterized by relatively high velocity, course substrate, and shallow water. Riffles are sub-divided into high-, medium- and low-gradient habitat types.

Riffle-pool (C-type) channel. A channel comprised of a series of alternating riffles (shallow, faster-flowing sections) and pools (deeper, slower-flowing sections), usually having a meandering alignment. This is classified as a C-type channel in Rosgen's Stream Classification System.

Riparian. Refers to features of the environment (e.g., vegetation types) living in, or located on, the bank of a natural watercourse such as a stream or river.

Riverine. Flowing fresh waters (salinity less than 0.5 parts per thousand) with less than 30 percent persistent vegetation cover; of, or relating to a river.

Rock deflector. A large rock placed in the channel to deflect flows from the channel bank or other sensitive area to reduce the effect of erosion forces.

Roost. A place where birds rest and sleep.

Rotenone. A plant-derived, crystalline pesticide that has low toxicity to warm-blooded animals (i.e., mammals) and relatively high toxicity to aquatic organisms (i.e., fish). Rotenone was applied to the Strawberry Reservoir to non-selectively kill all fish in the reservoir.

Run. A hydraulic (flowing water) habitat type that has intermediate flow velocity and depth.

Rush. A plant with cylindrical often hallow stems, that grows in marshes and wetlands.

Salinity concentrations. The amount of soluble salts contained in the soil, usually measured by the electrical conductivity of water removed from a soil paste under vacuum.

Sectors. The components or categories that an economy is divided into; they are often referred to as industrial sectors and include the construction, retail trade, service, manufacturing and agricultural sectors. The U.S. Department of Commerce has established standard economic sector definitions for measuring and reporting economic activity.

Scoping. The process used to determine the public's concerns and other input regarding proposed activities assessed in a National Environmental Policy Act (NEPA) document.

Scrape. A simple, shallow nest constructed by scraping an indentation into surface material such as soil or loose gravel.

Sedge. A grass-like, tufted plant that grows in wet areas.

Sediment. Material suspended in or settled to the bottom of a liquid from natural sources such as soil erosion or rock weathering or from human activity such as forest or agricultural practices or construction. Certain contaminants tend to collect on and adhere to sediment particles.

Sedimentation. The introduction of sediment material from an erosion source into a stream or lake.

Seeps. Areas where groundwater leaks onto the surface but doesn't create a defined channel

Sensitive receptors. Locations especially susceptible to noise impacts, such as schools, hospitals, nursing homes and residences.

Setback levee. A levee or dike that is set back from the channel bank and used to limit flooding from channel overflows.

Short-term impact. An impact that occurs during construction and does not continue beyond completion of construction (e.g., increased dust, noise, traffic, etc.).

Sill. A solid feature (typically concrete, wood or rock) extending across a channel to prevent down-cutting of the channel and maintain the bottom elevation at a given level; similar to a diversion dam.

Siltation. The process of introducing fine-particle materials to a stream, which then cover larger substrate particles that often is quality gravel substrate critical for trout habitat.

Social groups. A term used in social impact assessment to describe groups of people that form a community and would be affected by a project in a similar manner. The groups are not mutually exclusive; some individuals have interests and concerns that place them in more than one group. The members of each social group would likely experience common impacts on their lifestyles, behavior, attitudes, values and general well-being.

Socioeconomics. The resource topic or discipline that addresses potential impacts of a project on people and affected economies. Specific topics of analysis include impacts on businesses, personal income, employment, public services and fiscal resources of government agencies, housing, population and demographics, and social impacts.

Soil chemistry. The chemical makeup of the soil mass that includes such chemical constituents as reaction (pH), soluble and insoluble salts and minerals.

Soil quality. The combination of physical and chemical soil characteristics that determines the suitability for the production of food, feed, forage, fiber and oilseed crops.

Soil stability. The ability of a soil mass to resist the forces of wind and water erosion.

Soil stratification. Soil materials deposited by water, wind or formed in place, and commonly found in layers with different physical and chemical properties.

Soil texture. The relative proportions of sand, silt and clay particles in a mass of soil.

Spillway. A structure in a dam or canal that allows water to overpour at a controlled location when water levels reach a maximum allowable level.

Standard deviation. A measure of the variation of sampling data.

Standard Operating Procedures (SOPs). A process followed during construction, operation or maintenance of a project to avoid, minimize or rectify adverse impacts on natural resources and people.

Standing crop. The biomass of a particular group or groupings of organisms present at any one time (i.e., total weight of trout species in a stream).

Step-pool (B-type) channel. A channel comprised of a series of alternating steps (nearly vertical drops in the channel bottom) and pools (deeper, slower-flowing sections), usually having a relatively straight alignment. This is classified as a B-type channel in Rosgen's Stream Classification System.

Stratification. Layering of water caused by differences in water density.

Stream gage. A structure or device used to measure the flow of water in a stream or canal.

Substrate. Sediment particles that make up the stream or lake bottom. The classification or categorization of sediment particles present within a stream, lake or body of water includes; silt, sand, gravel, cobble and boulders.

Surface water. Water above the ground surface that is visible to the unaided eye, whether in channels, diffuse flow or standing; not necessarily permanent.

Talus. Loose deposit of angular rock, usually formed by the erosion of a rock cliff above the deposit.

Temporary impact. An impact that lasts for a limited time.

Temporary easements. A partial ownership of land providing the owner temporary access or other rights to certain uses of the parcel.

Thalweg. The point of maximum depth in a channel.

Threatened species. Any animal or plant species likely to become endangered within the foreseeable future throughout all or significant portion of its range.

Total phosphorus. The sum of all forms of phosphorus in water, including dissolved and particulate; usually expressed as a concentration with units of milligrams of phosphorus per liter of water (i.e., mg/L).

Total suspended solids. The amount of particulate matter larger than 0.45 micrometers suspended in water; usually expressed as a concentration with units of milligrams of suspended solids per liter of water (i.e., mg/L).

Transbasin diversion. A water diversion from one hydrologic drainage basin to another.

Tributary. A stream that flows into a large stream, river or other body of water.

Trout production. A measurement of the amount of trout biomass produced per unit area of a stream or body of water. Production usually is stated in terms of an element of time (e.g., pounds of trout per acre per year).

Upland. Any area that does not qualify as a wetland because the associated hydrologic regime is not wet enough to elicit development of vegetation, soils, and/or hydrologic characteristics associated with wetlands. Such areas occurring within floodplains are called non-wetlands.

Vertebrate. Species possessing a spinal column and more or less bony parts of an internal skeleton.

Vortex rock weir. A grade control feature extending across a channel comprised of interlocking boulders which is convex facing upstream and depressed in the center of the channel. It is designed to hold grade- and direct-flow energy toward the center of the channel and away from the banks.

Water rights. A legal right to take water and put it to beneficial use.

Water table. The upper surface of groundwater or the level below which the soil is saturated with water. It is at least 6 inches deep and persists in the soil for more than a few weeks.

Waterfowl. Any bird that frequents rivers and lakes, especially a swimming bird.

Wetland functions. The physical, chemical and biological processes or attributes of a wetland without regard to their importance to society.

Wetland hydrology. The sum total of wetness characteristics in areas that are inundated or have saturated soils for a long enough time to support vegetation that requires large amounts of water to grow.

Wetlands. Areas that are inundated by surface or groundwater often enough to support — and under normal circumstances does or would support — vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Wetted channel. The portion of the streambed that conveys water.

Acronyms and Abbreviations

Acronym	Description
1987 EIS	USBR's 1987 Supplement to the Final EIS on the CUP Municipal and Industrial System, Bonneville Unit
AADT	Annual Average Daily Traffic
AUM	Animal Unit Month
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
COE	U.S. Army Corps of Engineers
CRSP	Colorado River Storage Project
CUP	Central Utah Project
CUPCA	Central Utah Project Completion Act of 1992
CUWCD	Central Utah Water Conservancy District
DOI	U.S. Department of the Interior
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
EWPE	Eckhoff, Watson and Preator Engineering
FWCA	Fish and Wildlife Coordination Act
FWS	U.S. Fish and Wildlife Service
HABS	Historic American Building Survey
HAER	Historic American Engineering Record
HQI	Binns Habitat Quality Index (model)
JTAC	Jordanelle Reservoir Water Quality Technical Advisory Committee
M&I	Municipal and Industrial
Mitigation Commission	Utah Reclamation Mitigation and Conservation Commission
mmhos/cm	millimhos per centimeter
MODFLOW	USGS Three-Dimensional Finite Difference Groundwater Model
NAS	National Academy of Sciencies
NEPA	National Environmental Policy Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	Operation and Maintenance
PMF	Probable Maximum Flood
PMOA	Programmatic Memorandum or Agreement
PROSIM	Provo River Simulation Model
PRRP	Provo River Restoration Project
PRWUA	Provo River Water Users Association
ROD	Record of Decision
ROW	rights-of-way
SCS	Soil Conservation Service

SFN	Spanish Fork Canyon - Nephi Irrigation System
SHPO	Utah State Historic Preservation Office
SOPs	Standard Operating Procedures
T&E	Threatened and Endangered
UACRs	Utah Air Conservation Rules
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDOT	Utah Department of Transportation
UDP&R	Utah Division of Parks and Recreation
UNHP	Utah Natural Heritage Program
US	United States
USBR	U.S. Bureau of Reclamation
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
WCWEP	Wasatch County Water Efficiency Project

Abbreviation	Meaning
/	per
@	at
Ac	acre
ac-ft	acre-foot (feet)
cfs	cubic feet per second
Co.	company
cu yds	cubic yards
db	decibel
dBA	A-weighted decibels
e.g.	example
ft	foot or feet
gpm	gallons per minute
hp	horsepower
i.e.	such as
in.	inch
kg/ac/yr	kilogram per acre per year
kg/yr	kilograms per year
kwhr	kilowatt-hour
kwhr/yr	kilowatt-hours per year
lb	pound
lbs	pounds
lin ft	lineal feet
mg/L	milligrams per liter
mi.	mile(s)
NO_3	nitrates
NOx	nitrogen oxides
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
psi	pounds per square inch
SOx	sulfur oxides
sq ft	square feet
TP	total phosphorus
TSS	total suspended solids
w/	with
yr	year
Yr	Year
µg/L	micrograms per liter
°C	degrees Celsius
°F	degrees Fahrenheit

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Provo River
Restoration Project

APPENDICES

Final Environmental Impact Statement

Appendix A

Noxious Weed Control Plan

Appendix A
Noxious Weed Control Plan

A.1 Introduction

Noxious weed control is an important component of the Provo River Restoration Project (PRRP). Construction of this project would disturb a number of acres providing the opportunity for noxious weed invasion. The State of Utah maintains a list of noxious weeds and a mandate that these plant species be controlled on public and private lands under Section 4-17-3 of the Utah Noxious Weed Act. This appendix describes noxious weeds that are present in Heber Valley and could invade areas disturbed by construction activities, and provides a plan for preventing the spread of noxious weeds under the PRRP.

A.2 Noxious Weeds in Heber Valley

This section briefly describes the noxious weeds that can occur in Heber Valley and notes locations where weeds have been identified.

A.2.1 Canada Thistle *(Cirsium arvense)*

Canada thistle is an aggressive colony-forming perennial herb with deep and extensive deep-seated, horizontal rooting patterns. It is characterized by alternate, oblong or lance-shaped leaves divided into spiny-tipped irregular lobes with purple flower heads that appear in late summer. It is a difficult weed to control; breaking up the roots by plowing or disking increases the number of plants by spreading the roots.

Canada thistle is prevalent in some areas of the Heber Valley. There are documented locations along the upper reaches of the Provo River below Jordanelle Dam (Jones 1995; Young 1995).

Control of Canada thistle is especially important in areas that support habitat for Ute ladies'-tresses because the thistle forms thick monocultures that out-compete the orchid. There are documented orchid colonies along the Provo River below Jordanelle Dam.

A.2.2 Scotch Thistle *(Onopordum acanthium)*

Scotch thistle is an drought-tolerant, aggressive, biennial weed that grows up to 8 feet tall. Distinctive characteristics include: stems with broad spiny wings; large spiny, grayish-colored leaves covered with fine, dense hair and numerous flower heads with one to 2-inch diameter violet to reddish flowers. The basal leaves may grow up to 2 feet long and one foot wide.

This plant has spread into sagebrush, riparian, aspen and other native plant communities where it competes successfully with indigenous plant species. It is especially well adapted to livestock bed-ground and trail sites.

Control of noxious thistle species is especially important in critical habitat areas to avoid competition with Ute ladies'-tresses because thistles form thick monocultures that can out-compete the orchid.

A.2.3 Musk Thistle *(Carduus nutans)*

Musk thistle is an aggressive coarse biennial or sometimes a winter annual herb that grows up to 6 feet tall. Identifying characteristics include: tap-root, deeply-lobed, dark green leaves with light green midrib and spiny margins; disc flowers are deep rose, violet or purple, sometimes white. Musk thistle is a common invader of pastures, range and forest lands, waste areas, ditch banks, stream banks, and grain fields. Musk thistle can be

chemically controlled, but requires persistent spraying. Since the plants reproduce only through seeds produced every other year, the best control method is to cut the young plants off below the ground level. Scotch thistle is known to occur on U.S. property formerly owned by Walker and by Condie (Jones 1995; Young 1995).

Control of noxious thistle species is especially important in critical habitat areas to avoid competition with Ute ladies'-tresses because thistles form thick monocultures that can out-compete the orchid.

A.2.4 Yellow Starthistle *(Centaurea solstitialis)*

Yellow starthistle is an aggressive annual or biennial growing 2 to 3 feet in height. Distinguishing characteristics include: deeply lobed white basal leaves, sharp, entire upper leaves; slender rigid stems covered with cottony youth; yellow flowers appear in mid-summer and sharp yellow spines up to 3/4-inch long extend from the seed case immediately beneath the flower.

Starthistle has been identified in the northern reaches of the Provo River corridor below Jordanelle Dam (Young 1995). It can be poisonous to horses.

Control of noxious thistle species is especially important in critical habitat areas to avoid competition with Ute ladies'-tresses because thistles form thick monocultures that can out-compete the orchid.

A.2.5 Spotted Knapweed *(Centaurea maculosa)*

Spotted knapweed is a short-lived, tap-rooted, biennial or perennial with one or more branched stems growing 1 to 3 feet tall. It produces single ray-flowers at the ends of branches that are pinkish purple in color. Knapweeds readily establish on any disturbed soils and their early spring growth makes them compete with other more desirable plants for moisture and nutrients. This species rarely invades indigenous plant communities.

A.2.6 Squarrose Knapweed *(Centaurea virgata)*

Squarrose knapweed is a long-lived tap-rooted perennial that grows 12 to 18 inches in height. Stems are branched with deeply dissected lower leaves and bract-like upper leaves. Flower heads are small, producing 4 to 8 rose or pink colored flowers, and developing 3 to 4 seeds per head.

A.2.7 Leafy Spurge *(Euphorbia esula)*

Leafy spurge is an aggressive perennial herb growing up to 3 feet tall reproducing by vigorous rhizomes and seed. The lower leaves are narrow, strap-shaped approximately 2-inches long; the upper leaves near the flowers are opposite and broadly heart-shaped. Small flowers are yellowish-green, arranged in numerous small clusters. The entire plant contains milky juice. Seeds are oblong, grayish to purple, contained in a 3-celled capsule, each containing a single seed. The capsules explode when dry, often projecting seeds as far as 15 feet. Seeds may be viable in the soil for up to 8 years. Leafy spurge has an extensive root system containing large nutrient reserves making the plant extremely difficult to control and eradicate.

A.2.8 Whitetop *(Cardaria drabra)*

Whitetop (also called Hoary cress) is a white-hairy deep-rooted perennial growing up to 2 feet tall, reproducing from rhizomes and seeds forming dense clones. The stems are about one foot tall, with several branches bearing dense clusters of small white flowers. The branches grow nearly all the same height, giving the plant a flat-topped appearance. Fruits look like small inflated hearts. The toothed leaves clasp the stem

and have ear-like lobes. Plants emerge in early spring and have bloomed and set seed by mid-summer. Whitetop can be controlled effectively with herbicides.

A.2.9 Poison Hemlock *(Conium maculatum)*

Poison Hemlock is a coarse, extensively branched perennial that grows to over 6 feet in height. Purplish-red spots mark the erect, strong, hallow stems. Leaves are shiny green, parsley-like or fern-like in appearance and have enlarged petioles that clasp the stem. Each plant has numerous umbrella-shaped clusters of very small white flowers. The plant is deadly poisonous to humans.

A.2.10 Purple Loosestrife *(Lythrum salicaria)*

Purple loosestrife is a rhizomatious perennial with erect stems, growing to a height of 6 to 8 feet. Leaves are opposite or whorled. The flowers are rose-purplish and have 5 to 7 petals arranged in long vertical racemes. Purple loosestrife thrives on moist sites and can completely choke out wetlands and other aquatic vegetation. Infestations can grow so dense that water flow in canals, ditches and streams is impeded. This weed is not listed on the Utah Noxious Weed List, however, it should be controlled especially along ditches, canals, the Provo River and other waterways where it could become a significant problem.

A.3 Plan for Noxious Weed Control

This section presents a plan for preventing the spread of noxious weeds under the PRRP.

A.3.1 Seeding

Seeding would be the best method to guard against a significant invasion of noxious weeds on areas disturbed by construction of the PRRP. The objective of seeding would be to establish a cover of desirable plant species as quickly as possible after the completion of construction. Interim seeding of topsoil stockpiles and areas that would remain barren for an extended period would be necessary. Permanent seeding of disturbed soils would be conducted at the completion of earth-moving activities. Table A-1 lists plant species for seeding upland areas disturbed by construction activities. These species should be used in a dry land seed mixture to provide a cover of desirable plants. Table A-2 lists plant species for seeding riparian areas disturbed by construction activities. These species should be used in a seed mixture to provide a cover of desirable riparian plants. Table A-3 lists plant species for seeding emergent marshes, wet meadows and oxbows disturbed by construction activities. These species should be used in a seed mixture to provide a cover of desirable wetland plants.

A.3.2 Weed Surveys

Weed surveys would be conducted weekly after initial seeding to monitor for the presence of noxious weeds. Weeds identified through the surveys would be chemically treated or mechanically or hand-removed before they develop seeds or have the opportunity to spread rhizomatious roots and establish large colonies that are hard to eradicate. Fall and spring weed surveys would be conducted to identify and locate perennial and biennial weeds in their early stages of development. Photographs or drawings of the noxious weeds described in Section A.2 would be distributed to the construction contractors to help identify weeds and take steps to eradicate them using approved methods.

Table A-1
Plant Species for Seeding Upland Areas Disturbed by Construction Activities

Common Name	Scientific Name (Synonyms)
Bluebunch wheatgrass	*Agropyron spicatum (Pseudoroegneria spicata)*
Western wheatgrass	*Agropyron smithii (Pascopyrum smithii)*
Thickspike wheatgrass	*Agropyron dasystachyrum (Elymus lanceolatus)*
Streambank wheatgrass	*Agropyron dasystachyrum riparium (Elymus lanceolatus riparium)*
Sheep fescue	*Festuca ovina*
Hard fescue	*Festuca ovina* var. *duriuscula*
Big bluegrass	*Poa ampla*
Indian ricegrass	*Oryzopsis hymenoides*
Cicer milkvetch	*Astragalus cicer*
Lewis flax	*Linum perenne lewisii*
Alfalfa	*Medicago sativa*
Squirreltail	*Elymus elymoides* - native invader of disturbed areas
Great basin wildrye	*Elymus cinereus* - moist to dry site/native
Mountain brome	*Bromus marginatus*
Yarrow	*Achillea millefolium*
Slender wheatgrass	*Elymus trachycaulus*
Blue wildrye	*Elymus glaucus* - streamside communities
Wood's rose	*Rosa woodsii* - native shrub
Rabbitbrush	*Chrysothaminus nauseosus*
Wyoming big sagebrush	*Artemisia tridentata*

Table A-2
Plant Species for Seeding Riparian Areas Disturbed by Construction Activities

Common Name	Scientific Name (Synonyms)
Trees	
Narrowleaf cottonwood	*Populus angustifolia*
Mountain alder	*Alnus incana*
River birch	*Betula occidentalis*
River hawthorne	*Crataegus douglassi*
Woody Shrubs	
Whiplash willow	*Salix lasiandra*
Yellow willow	*Salix lutea*
Sandbar willow	*Salix exigua*
Dogwood	*Cornus sericea*
Wood's rose	*Rosa woodsii*
Twinberry	*Lonicera involucrata*
Raspberry	*Rubus idaeus*
Forbs	
Yarrow	*Achillea millefolium*
Goldenrod	*Solidago canadensis*
Sedges/Grasses/Rushes	
Nebraska sedge	*Caarex nebrascensis* - lower banks
Baltic rush	*Juncus balticus* - lower banks
Blue wildrye	*Elymus glaucus* - upper banks
Slender wheatgrass	*Elymus trachycaulus* - upper banks
Western wheatgrass	*Elymus smithii* - upper banks
Great basin wildrye	*Elymus cinereus* - upper banks
Squirreltail	*Elymus elymoides* - upper banks
Mountain brome	*Bromus marginatus* - upper banks

Table A-3
Plant Species for Seeding Emergent Marsh & Wet Meadow/Oxbows Disturbed by Construction Activities

Common Name	Scientific Name (Synonyms)
Emergent Marsh	
Haredstem bulrush	*Scirpus acutus*
Beaked sedge	*Carex rostrata*
Nebraska sedge	*Carex nebrascensis*
Water sedge	*Carex aquatilisq*
Baltic rush	*Juncus balticus*
Wet Meadow/Oxbows	
Beaked sedge	*Carex rostrata*
Nebraska sedge	*Carex nebrascensis*
Baltic rush	*Juncus balticus*
Water sedge	*Carex aquatilis*

A.3.2 Herbicide Control

Herbicides such as Roundup™, Weedmaster™, Banvel™ and similar products can be effective in control of noxious weeds. Herbicides should always be applied according to the manufacturers' printed recommendations and according to Federal regulations governing herbicide application.

All Federally Restricted-Use Herbicides must be applied by a Certified Applicator (U.S. Dept. of Agriculture 1993). Commercial and private applicators of Federal Restricted-Use Herbicides must keep a record of the Federal Restricted-Use Herbicide applications: The record must contain the following information:

- The brand or product name of the Federal restricted-use herbicide and its EPA registration number
- The total amount of the herbicide applied
- The size of the area treated
- The crop, commodity, stored product or site to which the herbicide was applied
- The location of the herbicide application
- The month, day and year of the application
- The certified applicator's name and certification

The information must be recorded within 30 days following the herbicide application. The record must be kept for two years from the date of the herbicide application.

A.3.4 Mechanical or Hand Control

Mechanical or hand control of noxious weeds identified in areas disturbed by construction activities would be used as an alternative to herbicide application. Mechanical control would involve using construction equipment such as a bulldozer or loader to scrape the soil surface and collect the weeds prior to development of seeds. Hand control of weeds would involve digging or pulling up weeds using hand tools prior to development of seeds. Noxious weeds would be controlled by hand removal in areas of sensitive habitats such as those occupied by Ute-ladies'-tresses or spotted frog. Collected weeds would be burned or properly disposed to prevent spreading onto other disturbed areas.

Appendix B

Impact Analysis Methodology

Appendix B
PRRP EIS Impact Analysis Methodology

B.1 Introduction

This appendix describes the methodology used to analyze impacts on each resource presented in Chapter 3 of the Provo River Restoration Project (PRRP) Final EIS.

B.2 PRRP Analysis Methodologies

The methodologies are presented by resource in the order they appear in Chapter 3 of the PRRP Final EIS.

B.2.1 Water Resources Analysis Methodology

The water resources analysis methodology includes assumptions and impact topic analysis methods for surface water and groundwater. A more detailed discussion of the water resources analysis methodology is presented in the Final Water Resources Technical Report (Mitigation Commission 1997b).

B.2.1.1 Assumptions

The surface water analysis relies on the PROSIM and MODFLOW models (described in Section B.2.1.2.1) to produce simulations of surface water conditions in Heber Valley. Computations with spreadsheets also are used to analyze water needs and supply availability. These models, spreadsheets and their input data require many assumptions. Major assumptions used in the surface water analysis are listed below for baseline conditions, the Proposed Action and the PRRP alternatives.

B.2.1.1.1 Assumptions Used In Modeling Baseline. The following key assumptions were used to model surface water and groundwater baseline conditions:

- Minimum streamflow requirements of 125 cubic feet per second (cfs) are in place at all times in the Provo River between Jordanelle and Deer Creek reservoirs

- The Central Utah Water Conservancy District (CUWCD) allocates the same average annual amount of Central Utah Project (CUP) water as previously allocated by the USBR in the 1988 draft supplement to the Definite Plan Report (USBR 1988). These average annual allocations are:

Agricultural, Francis area:	3,000 acre-feet
Agricultural, Heber City area:	12,100 acre-feet
M&I, Heber City area:	2,400 acre-feet
M&I, North Utah County:	20,000 acre-feet
M&I, Salt Lake County:	70,000 acre-feet
Total:	107,500 acre-feet

- All CUP municipal and industrial (M&I) water in the Heber City area is conveyed through the Wasatch Canal to a centralized water treatment plant near Heber City, and treated water would be distributed across the valley from the treatment plant.

- Future Heber Valley water consumption will remain essentially the same as present, although use will shift from agricultural to M&I. Lands converted from agricultural to other uses use about the same quantity of water as the existing lands. Water users will continue to rely on surface water as the primary

source and not the valley's groundwater basin. All new rights for groundwater extraction to supply new development would be obtained through exchange and retirement of local surface water rights.

- Jordanelle Reservoir is fully operational and all CUP water users reach full buildout demand levels with full utilization of Provo River water supplies. The Provo River demands are:

Provo River Project:	100,000 acre-feet every year
CUP:	107,500 acre-feet variable annual demand
Summit County Water Users:	Historical diversions limited to water rights
Wasatch County Water Users:	Historical diversions limited to water rights
Utah County Water Users:	Historical diversions limited to water rights

- All diversions on the Provo River are made according to water right limits.

- Twelve percent of diverted, unconsumed agricultural water in Heber Valley is lost from the Provo River system and does not return to the river. Unconsumed agricultural water is water that is not transpired into the air by crops or evaporated.

- Potential water right adjudications by the Utah state engineer are speculative at this time and therefore are not considered.

- The Central Utah Project Completion Act (CUPCA) authorized CUWCD to purchase "from willing sellers or exchange, twenty-five thousand acre-feet of water rights in the Utah Lake drainage basin" to establish, among other things, "flows in the Provo River from the Olmsted Diversion to Utah Lake, a minimum of seventy-five cubic feet per second." CUWCD has not identified a water supply for meeting the 75 cfs instream flow requirement. Therefore, this instream flow requirement is not included in the PROSIM modeling conducted for this EIS (it applies to baseline, Proposed Action and PRRP alternatives).

B.2.1.1.2 Assumptions Used In Modeling the Proposed Action and Alternatives. The following key assumptions that differ from assumptions used for baseline conditions were used to model the Proposed Action and alternatives:

- Baseline flows needed in the lower Provo River to protect the June Sucker, an endangered fish, cannot be stored in Jordanelle Reservoir. Baseline spills in excess of the needs of downstream users or the June Sucker can be stored in Jordanelle Reservoir.

It was assumed the water supply for side channel flows under the Proposed Action would be Provo River flow bypassed through the channels and back into the Provo River. These side channels would be 1,000 feet or less from the centerline of the Provo River. Therefore, no changes in releases from Jordanelle Reservoir would be required to provide flows for the side channels. Flows in the main channel of the Provo River could be less than the minimum instream flow requirement of 125 cfs, as long as the combined total flow of the main channel and any side channels conveying bypassed river flows was at least 125 cfs at all locations between Jordanelle and Deer Creek reservoirs.

B.2.1.2 Impact Topic Analysis Methods

B.2.1.2.1 Overall Approach. Most of the potential surface water changes identified in this water resources analysis were modeled with PROSIM, which is a comprehensive surface water, Provo River Project and CUP operations model that simulates Provo River, Jordanelle Reservoir and Deer Creek Reservoir surface water conditions. PROSIM is a computerized representation of the hydrology, facilities, water rights and institutional arrangements of the Provo River system. PROSIM models all of the Provo River watershed, the Weber River above the mouth of Weber Canyon, Utah Lake, and the upper Duchesne River on a

monthly time periods. It also models transbasin diversions from the Weber River, Strawberry Reservoir and Duchesne River to the Provo River basin. Potential surface water changes in Daniels Creek, the streams to receive supplemental flows, and the supplies of irrigation companies in Heber Valley were defined using a hydrologic spreadsheet model (which is separate from the PROSIM model).

Potential groundwater changes were modeled with MODFLOW, a general-purpose groundwater model. Development and calibration of the MODFLOW model of Heber Valley was performed by the U.S. Geological Survey (USGS) in cooperation with the Utah Department of Natural Resources (UDNR) and Wasatch County. The model divides Heber Valley into a network of 40-acre elements consisting of 45 rows by 45 columns.

The Heber Valley groundwater basin is represented by two aquifer layers with varying parameters, including water storage and flow rates for each 40-acre element. The model was run to represent the same hydrologic period that was used for PROSIM. MODFLOW, like PROSIM, is run with monthly time periods. The model calculates water levels, storage and return flows for each month of the modeled hydrology.

River reach lengths, elevations and stages under the Proposed Action were changed in the model from baseline conditions. The Existing Channel Modification and Instream Structures alternatives were not modeled for groundwater changes because they do not have the potential to significantly change the Provo River's flow, grade or flow depth.

The water resources analysis consisted of the following five major steps:

- Comparing and reconciling the PROSIM and MODFLOW hydrology models
- Defining the modeling scenarios, assumptions and input data
- Conducting the PROSIM and MODFLOW model runs
- Documenting the PROSIM and MODFLOW output
- Preparing water resources impact summaries and water balance documentation

Impacts were evaluated over a 40-year study period using the hydrology that occurred from 1950 through 1989 with future demand levels. The results presented are for years 1 through 40 of the study period.

Baseline conditions used in this analysis are future conditions that would occur when Jordanelle Reservoir becomes fully operational and reaches full water demand levels, as set forth in the Bonneville Unit M & I System Final Supplement to the Final Environmental Statement (USBR 1987) completed before construction of the reservoir. Therefore, water diversions and Provo River flows under baseline are not existing conditions. They are future conditions that would occur as a result of the construction and full operation of Jordanelle Reservoir.

Baseline conditions are significantly different from existing and historical conditions for several reasons. For example, the EIS baseline includes a fully operational Jordanelle Reservoir. This includes deliveries of 90,000 acre-feet a year of CUP M&I water to Utah and Salt Lake counties; 2,400 acre-feet a year of CUP M&I water to Wasatch County; 12,100 acre-feet a year of supplemental agricultural water to Heber Valley; and 3,000 acre-feet a year of supplemental agricultural water to the southern Kamas Valley. On-farm water application efficiencies were assumed to increase under baseline conditions from the current 18 to 35 percent to 40 percent as a result of improved water management and measuring techniques.

Several other river system operational changes are included in baseline conditions that have occurred only recently or are not yet in effect, including the Utah Lake Interim Water Distribution Plan (Utah Division of Water Rights 1992). This is a plan by the Utah Division of Water Rights for managing the water supply of the Utah Lake drainage, especially during low flow years. Another change from existing conditions is the 125 cfs minimum instream flow requirement between Jordanelle and Deer Creek reservoirs. This requirement was among the commitments included in the Final Supplement to the Final Environmental Impact Statement on the CUP, M&I System (USBR 1987) that analyzed the effects of Jordanelle Reservoir, and that has been

met since July 1996 when Jordanelle Reservoir filled and became operational. This EIS uses the commitments of the 1987 EIS in all modeling assumptions. The provisions of the recently negotiated Deer Creek/Jordanelle Operating Agreement also are included in the modeling of the baseline conditions. These provisions have not been reflected in historical or existing conditions.

B.2.1.2.2 Surface Water Methodology. Surface water conditions were modeled by PROSIM and a hydrologic spreadsheet model. Results were compared against baseline results to determine the impacts of the Proposed Action and alternatives.

The distribution of CUP agricultural water by month, year and irrigation company was in proportion to the irrigation supply shortages of each company. Consumptive use and water diversion requirements were defined by a Technical Advisory Committee (CUWCD 1993b). Supply shortages were calculated for each irrigation company on a monthly basis by subtracting the available water supply from the computed diversion requirement.

To avoid potential reductions in diversions and streamflow in the Provo River below Deer Creek Reservoir, CUP water stored in Jordanelle and Deer Creek reservoirs in the PROSIM model is released when necessary to supplement Lower Provo River flows. Thus, if modeled flows under one of the EIS alternatives are less than modeled flows under baseline conditions, water is released from Jordanelle storage to bring the flow up to the level under baseline conditions subject to certain limits specified in the Deer Creek Biological Opinion.

To avoid potential impacts on areas outside the Provo River basin, transbasin diversions from the Weber and Duchesne rivers were limited to the amounts diverted under baseline conditions.

B.2.1.2.3 Groundwater Methodology. The groundwater methodology considered four impact topics: groundwater recharge, discharge and storage; groundwater levels; and groundwater levels in wetland areas. The following subsections describe the methodology used for each topic.

B.2.1.2.3.1 Groundwater Recharge, Discharge and Storage. A spreadsheet model was used to calculate crop consumptive use and the amount of recharge to the groundwater basin for all Heber Valley irrigation companies on a monthly basis. The amount of applied water for each irrigation company, including CUP and non CUP water, was added to precipitation to determine total available water supply. During months when the total available water supply of an irrigation company exceeded crop needs, consumptive use was set equal to the full potential consumptive use. During months with less than a full water supply, consumptive use was set equal to the ratio of available supply to crop need, multiplied by the full potential consumptive use.

The computed consumptive use was subtracted from the total available water supply to determine the amount of water that would percolate into the ground as groundwater recharge. This recharge was input to the MODFLOW model and was "spread" in the model over the irrigation company land. Seepage from canals (conveyance losses) and streams also was computed in the spreadsheet model and input to MODFLOW. Groundwater recharge differences between alternatives and baseline conditions were determined and documented as change in unconsumed agricultural water and precipitation, supplemental instream and Daniels Creek channel seepage.

Groundwater discharge was computed within the model. Discharge to local drains and seeps, evapotranspiration, Snake Creek, Provo River, and Deer Creek Reservoir was summarized by the model for each month of simulation. Impacts under the alternatives were determined by computing the change in these discharge values between the baseline conditions and each alternative.

Monthly changes in groundwater storage were defined by determining the monthly difference between groundwater discharge and recharge. Monthly changes in recharge, discharge and storage were summarized in water budget tables.

B.2.1.2.3.2 Groundwater Levels. The model was used to simulate groundwater level changes for each month and for each 40-acre element in Heber Valley. These water levels were compared using contour maps of the entire basin for a representative time period and by using hydrographs that show seasonal and annual fluctuation in water levels for a representative location. Using these two graphic summary tools, the baseline model results were compared to each alternative to determine impacts on groundwater levels. Baseline groundwater levels and impacts associated with the Proposed Action and alternatives were documented in this report with contour maps, hydrographs and cross-sections.

B.2.1.2.3.3 Groundwater Levels in Wetland Areas. The MODFLOW model is a regional groundwater model that simulates general groundwater level changes, assuming uniform distribution and application of surface water in each irrigation company. A more detailed groundwater analysis was conducted in wetland areas to evaluate site-specific conditions. Specific areas of land in 5-acre parcels and their specific irrigation methods and recharge rates were evaluated. Areas that would be converted to sprinkler irrigation were mapped and overlaid on a map with wetlands. The focus of the detailed analysis was thus narrowed to the areas with wetlands. Site-specific changes in groundwater recharge from baseline conditions were computed for areas of concern that would be converted to sprinkler irrigation. No change in recharge was assumed for areas not converted. The change in recharge was multiplied by the average water content of the soil in the affected areas to define potential changes in shallow groundwater levels. The lateral area influenced by the change in groundwater level under the converted areas was determined and mapped.

B.2.2 Water Quality Analysis Methodology

This section presents the water quality analysis methodology. A more detailed discussion is presented in the Final Water Quality Technical Report (Mitigation Commission 1997c).

B.2.2.1 Assumptions

The water quality analysis assumes existing flood irrigation practices do not create surface runoff into streams and canals (U.S. Soil Conservation Service 1994) because the alluvial soils in Heber Valley are very porous. Conversion to sprinkler irrigation would therefore not change the pathway of return flows from irrigation back to the streams, canals or Deer Creek Reservoir. However, it would change the volume of water returned to Deer Creek Reservoir through groundwater return flow pathways because use of conserved water to augment stream flows would increase surface discharge to the reservoir at the expense of groundwater.

The water quality analysis assumes the impacts of existing nonpoint source pollution practices are reflected in the existing water quality monitoring data. Therefore, unless future activities (included under baseline conditions or associated with the Proposed Action and alternatives) create or expand nonpoint source activities, the impacts of these existing activities are already included in the monitored data.

The water quality analysis assumes the parameters are conservative and that water quality changes can be estimated with mixing and dilution. The parameters are considered conservative because it is assumed they would not change phases, for example, nitrates (NO_3) to nitrite.

Jordanelle Reservoir was constructed with a Selected Level Outlet Works (SLOW) to help protect downstream water quality by allowing water to be discharged from different layers in the reservoir based on water temperature. However, the operational memorandum for the SLOW is being prepared and limited monitoring data available for the reservoir reflect conditions when the reservoir has been fully operational for only one year. Therefore, it was assumed the quality of water discharged from Jordanelle Reservoir for baseline conditions and the alternatives could be represented with reservoir surface water monitoring data collected by Jordanelle Technical Advisory Committee (JTAC) in 1993 (EWPE 1994). This assumption is supported by concentrations projected by Sowby and Berg (1984) after the data were corrected for phosphorus sedimentation. Sowby and Berg projected a reservoir total phosphorus (TP) concentration of 39

mg/l without sedimentation. They projected phosphorus sedimentation at about 50 percent per year or 4,800 Kg/yr. Correcting the projected concentration of 39 micrograms per liter (mg/l) for 50 percent sedimentation yields an in-reservoir TP concentration of 20 mg/l. This value closely matches the 1993 monitored surface water concentration of 21 mg/l TP (EWPE 1994).

Provo River monitoring data collected from 1984 through 1989 were assumed to represent conditions before operation of Jordanelle Reservoir.

It was assumed existing groundwater concentrations of TP and NO_3 have reached steady- state conditions with groundwater recharge. This assumption is reasonable because the primary source of groundwater is recharge, and the groundwater is shallow and of relatively recent origin. This means historical groundwater concentrations are not undergoing significant change and reflect the long-term quality of the recharge water. The TP and NO_3 concentrations in groundwater recharge equal existing groundwater concentrations under this assumption. Short-term climatic conditions were assumed to not affect existing groundwater concentrations, and existing concentrations were used to represent average-, wet- and dry-year conditions.

It was assumed existing temperature monitoring data collected before construction of Jordanelle Reservoir for the Provo River and Rock Ditch represented baseline conditions when instream flows at the time of sample collection were similar to baseline flows. This assumption is reasonable for dry-water-year, high-temperature conditions where temperature would be largely controlled by climatic conditions and solar heating at the stream surface. This assumption also is supported by results of the temperature transition zone modeling completed as part of this assessment, which showed that the temperature of Jordanelle Reservoir under these conditions would only affect a very small reach of the Provo River below the dam.

It was assumed the amount of solar radiation reaching the surface of the Provo River in a specific reach is inversely proportional to the percentage of the reach that has riparian vegetation. This approach is conservative with respect to identifying impacts because it assumes all existing riparian vegetation provides shading, and the loss of that riparian vegetation would increase solar radiation.

It was assumed the daily average water temperature data collected for the Provo River above Deer Creek Reservoir in 1993 and 1994 by the JTAC represents baseline equilibrium temperatures. This assumption is appropriate because the transition zone analysis completed for the PRRP EIS concluded late summer releases from Jordanelle Reservoir would reach equilibrium with ambient meteorological conditions and groundwater return flow within a short distance below the dam.

The average annual TP load from Main Creek outside the project area was assumed to equal the average 1988 through 1993 loads estimated by EWPE (1994) or 1,290 kilograms per year (kg/year). Deer Creek Reservoir TP retention coefficients were assumed to be 25 percent, 48 percent and 17 percent for average-, dry- and wet-year conditions, respectively, based on values calculated by EWPE (1994).

B.2.2.2 Impact Topic Analysis Methods

Existing water quality conditions were defined and adjusted to develop baseline conditions using results of the water resources analysis Section B.2.1. As described in that section, baseline conditions are significantly different than existing and historical conditions. Potential water quality impacts of each alternative were then defined by comparing baseline water quality conditions to conditions expected to occur under the Proposed Action and alternatives.

The general approach used to estimate baseline conditions consisted of utilizing existing surface water and groundwater quality data to determine quality characteristics for water originating in Heber Valley and water flowing into the valley from the Provo River. The water quality characteristics of Heber Valley source water were assumed to reflect the nonpoint source pollution activities in the valley. Baseline conditions were then estimated by adjusting the water flowing into the valley from the Provo River, using estimated water quality

conditions with a fully operational Jordanelle Reservoir, and adjusting the characteristics using pollutant loads contributed by Heber Valley water. The same approach was used for analyzing the Proposed Action and alternatives, which allows groundwater and surface water pollutant loads to be adjusted for changes in the use of water discharged from Jordanelle Reservoir and from changes in nonpoint source activities in the valley.

Baseline water quality of the discharge from Jordanelle Reservoir was determined using monitored data from the Reservoir and previous studies. Sowby and Berg (1984) estimate Jordanelle Reservoir would retain about 50 percent of the existing annual phosphorus inflow to Heber Valley from the Provo River, or 4,800 kg of phosphorus per year. Higher retention coefficients would be expected for sediment. Retention of phosphorus and sediment in Jordanelle Reservoir would reduce these constituent loads in downstream streams and canals and the loads to Deer Creek Reservoir. These expected load reductions were considered in establishing baseline conditions.

Baseline eutrophication conditions in Deer Creek Reservoir were evaluated using total phosphorus loads and a reservoir phosphorus sedimentation model. Phosphorus loads discharged into the reservoir were calculated for groundwater, Daniels Creek and the Provo River. Loads from Main Creek and phosphorus retention coefficients were obtained from estimates by EWPE (1994).

Hydrologic conditions predicted by the PROSIM and MODFLOW models were used to establish baseline water quality conditions and to analyze the alternatives. Model descriptions are presented in Section 2.4 of the Final Water Resources Technical Report (Mitigation Commission 1997b). These results were used to estimate pollutant loads and flow-weighted mean concentrations of TP, total suspended solids (TSS), and NO_3 for stream sites in Heber Valley, and to estimate phosphorus loads discharged to Deer Creek Reservoir. Annual pollutant loads and flow-weighted concentrations were estimated for average-, wet- and dry-year conditions.

Existing temperature conditions were evaluated using hourly data collected from the Provo River by JTAC during 1993 and 1994. These data were combined with stream flows for the Provo River and used to identify water temperatures in Reach 2 under existing conditions. These temperatures were identified for specific dates during late summer when flows were similar to flows anticipated for a dry year under baseline conditions. Late summer meteorological conditions combined with dry year flows represent a worst-case high-temperature condition. The following heat balance equation from Thomann and Mueller (1987) was then used to estimate temperatures in the other reaches, based on a ratio of the percent riparian vegetation in Reach 2 to the percent in the other reaches:

$$T_e = T_d + H_s/K$$

where:

T_e = Equilibrium temperature (°C)
T_d = Dewpoint temperature (°C)
K = Estimated average surface heat exchange coefficient (cal/cm^2 day°C))
H_s = Short-wave radiation (cal/(cm^2 day)

For example the monitored average daily water temperature in Reach 2 on July 26, 1993 was 55.8°F (13.2°C). The average dew point temperature for Salt Lake City on July 26, 1993 was 50°F (10°C) (NOAA, 1993). Correcting the dew point temperature for the elevation of the Heber Valley with a correction factor of 2.2°F per 1,000 feet (Peck 1967) gives a corrected dew point temperature for the Heber Valley of 46.9°F (8.3°C). Solving for H_s/K for Reach 2 gives:

$$H_s/K_{(\text{Reach 2})} = 13.2°C - 8.3°C = 4.9°C$$

The length of channel in Reach 2 is 5,400 feet, of which the average length of each bank that has riparian vegetation is 3,590 feet, or 66 percent of the total reach length. Reach 7 has a length of 4,730 feet of

which the average length of each bank with riparian vegetation is 4,350 feet, or 92 percent of the total length. Weighting the H_s/K function in Reach 2 by the percentage of vegetation in Reach 7 gives an H_s/K function for Reach 7 as:

$$H_s/K_{(Reach\ 7)} = (1 - (0.92 - 0.66)/0.66) \times 4.9°C = 3.0°C$$

The equilibrium temperature under baseline in Reach 7 then equals:

$$T_e = 8.3°C + 3.0°C = 11.3°C\ (52.3°F)$$

The potential for the PRRP to increase TSS and TP loads and concentrations in the Provo River was largely based on the potential of the Proposed Action and alternatives to cause channel erosion and erosion from construction activities. An evaluation of the potential for erosion during construction and during the long-term is presented in Section 3.8 of the PRRP EIS.

Potential changes in TSS and TP loads and concentrations also were assessed by evaluating the amount and type of land to be acquired under each of the Proposed Action and alternatives, which varies (see Section 1.3, Table 1-7 of the PRRP EIS). However, all of the land acquired for project purposes would be fenced, which excludes livestock and promotes the change from pasture to more natural open space. TP loads would change from a baseline export rate associated with pasture to one associated with open space and forest. Export rates from Olem and Flock (1990) indicate that this change could decrease TP loads by 1.48 kilograms per acre per year (kg/ac/yr). This export rate was used to estimate the reduction in TP loads associated with each alternative.

The potential for PRRP construction activities to impact TP and NO_3 loads from septic systems was evaluated by reviewing the design criteria for the PRRP and comparing them with an inventory of septic systems compiled by Hansen, Allen, and Luce (1994).

The approach used for evaluating potential water temperature impacts of the Proposed Action and alternatives was designed to isolate the effects of changes in shading in each reach of the Provo River. This approach was very conservative with respect to identifying temperature increases because it assumes all existing riparian vegetation provides shading and that the loss of that riparian vegetation would increase solar radiation, when in fact existing vegetation does not provide effective shading along much of the river. The water temperature analysis was conducted for the late summer period of a dry year — a worst-case, high-temperature period.

The channel length with riparian vegetation remaining in each reach after construction was estimated using the preliminary design drawings of the Proposed Action and alternatives. The baseline heat balances for each reach were then weighted by the percentage change in the length of riparian vegetation remaining to estimate equilibrium temperatures for each reach and alternative. The length of riparian vegetation remaining in each reach for the Proposed Action was divided by the new reach length to account for increased reach lengths under the Proposed Action. For example Reach 7 under the Proposed Action will be 6,100 feet long. Existing riparian vegetation would not be cleared from 47 percent of this reach. Therefore, the new H_s/K function for Reach 7 would be:

$$H_s/K_{(Reach\ 7)} = (1-(0.47- 0.66)/0.66) \times 4.9°C = 6.3°C$$

and the estimated equilibrium temperature in Reach 7 under the Proposed Action is:

$$T_e = 8.3°C + 6.3°C = 14.6°C\ (58.3°F)$$

The analysis addressed long-term water temperatures after re-establishment of cottonwood trees and other riparian vegetation included in the Riverine Habitat Restoration and Existing Channel Modification

alternatives. The approach for considering long-term changes considered revegetation, the magnitude of the short-term increases, and the fact that meteorological conditions would not be altered by the alternatives.

Analysis of the potential to increase sediment loading and eutrophication in Deer Creek Reservoir was completed using the Provo River nutrient and sediment assessment described above and results of the eutrophication model described in Section B.2.2.2 of this appendix.

The water quality analysis contains several uncertainties. These are the result of the uncertainty and variation in the existing monitoring data, the uncertainty in predicting future conditions after Jordanelle Reservoir is fully operational and the uncertainties in data from other related disciplines used in this analysis (i.e., water resources, soils and agriculture). Therefore, throughout the water quality analysis, conservative methodologies were used to help address uncertainties and to take a conservative approach in identifying adverse impacts.

The water quality analysis contains some uncertainties because of variations in existing monitoring data, the uncertainty of predicting future conditions after Jordanelle Reservoir is fully operational, and uncertainties in data from other related disciplines used in this analysis (i.e., Water Resources, Soils and Agriculture). Therefore, throughout the water quality analysis, conservative methodologies were used to help address uncertainties and to take a conservative approach in identifying adverse impacts.

B.2.3 Wetlands Analysis Methodology

This section describes the wetlands analysis methodology. A more detailed discussion is presented in the Final Wetlands Technical Report (Mitigation Commission 1997d).

B.2.3.1 Assumptions

Jordanelle Reservoir was not fully operational when the wetland impact analysis was conducted. The primary distinction between existing conditions and the future hydrology baseline conditions under Jordanelle Reservoir operation related to wetlands is the availability and application of minimum instream flows of 125 cfs since Jordanelle Reservoir became fully operational in July 1996. The future conditions of wetlands under the operation of Jordanelle Reservoir and the application of supplemental CUP water could not be determined, therefore it was assumed that existing conditions are baseline conditions for the wetland impact analysis.

B.2.3.2 Impact Topic Analysis Methods

Potential construction-related impacts were evaluated for each alternative by superimposing the engineering plans for the Proposed Action and PRRP alternatives on baseline wetland maps. The resulting overlay was used to identify any specific wetland types that would be directly impacted during the long-term by removal of vegetation and soil disturbance associated with construction of a new river channel, side channels, setback dikes and floodplain grading. These areas were reviewed and measured in the field to develop an estimate of impacted wetlands. Additional wetland areas in the construction corridor were reviewed that would be directly impacted during the short-term by the operation of construction equipment.

To respond to concerns about potential impacts on cottonwood trees, the number of mature (greater than 20 feet in height) cottonwood trees potentially impacted by construction of each alternative was counted or estimated during the field review. Cottonwood trees occurring as single trees or small groups, usually in narrow bands along the margins of the existing dikes, were counted individually. The number of trees occurring within the Riparian Woodland vegetation type, which was quantified as per the methods described previously for wetland types, were estimated based on the average number of trees per acre. Therefore, most of the cottonwood trees depicted on tables in Section 3.4 (which show the number of cottonwood trees to be impacted) are also included in the estimate of acreage of Riparian Woodland (RW) vegetation type to be

impacted. Map A-5 and Map A-6 describe in detail the acreage of vegetation (including Riparian Woodland) and the number of cottonwood trees not occurring within the Riparian Woodland wetland type, that would be impacted by the Proposed Action and the Existing Channel Modification Alternative, respectively.

B.2.4 Aquatic Resources Analysis Methodology

This section describes the aquatic resources analysis methodology. A more detailed discussion is presented in the Final Aquatic Resources Technical Report (Mitigation Commission 1997a).

B.2.4.1 Assumptions

The aquatic resources analysis assumed that baseline conditions include a 125 cfs minimum instream flow in the Provo River. The analysis of potential impacts assumed the results of the Binns HQI Model II that show changes in aquatic habitat features are generally applicable to non-game fish and other aquatic resources.

The results of the Binns HQI Model II for predicted trout standing crop and the resulting calculation of predicted trout biomass assumed that the increases were due to natural production and not from stocking hatchery-produced fish.

B.2.4.2 Impact Topic Analysis Methods

B.2.4.2.1 Game Fish and Their Habitat. Potential impacts on game fish and their habitat were analyzed by using the results of quantitative aquatic habitat field surveys to predict the magnitude of change in trout production resulting from implementation of the Proposed Action and alternatives. The Binns Habitat Quality Index (HQI) Model II was used to estimate potential changes in aquatic habitat (see description in Section B.2.4.2.1.2). The following subsections describe the field survey methodology used to define baseline conditions and the general procedures of the Binns HQI Model II.

B.2.4.2.1.1 Definition of Baseline Conditions. Baseline conditions were defined in the impact area of influence through field surveys that resulted in fish population estimates and other quantitative estimates of aquatic habitat. Conditions under the Proposed Action and alternatives were compared to baseline conditions to determine potential impacts.

Aquatic resources field surveys were conducted in the Provo River in July 1993. Results of these surveys reflect existing conditions in the Provo River without the 125 cfs minimum instream flow that would be established under baseline conditions. Therefore, the 1993 survey results underestimate baseline aquatic habitat and fish use.

The Binns (HQI) Model II was used to estimate baseline conditions with 125 cfs minimum instream flow (see Section B.2.4.2.1.2 of this appendix). The habitat attribute ratings for late summer flow and annual streamflow variation that were assigned based on the 1993 field surveys were modified to reflect optimal instream flows under baseline conditions. The resulting HQI scores with these adjusted habitat attribute ratings were used as the values for baseline conditions.

Typical pool and riffle cross-sections were analyzed to determine the area of trout habitat provided for the Proposed Action and alternatives. The amount of pool and riffle area created under the Proposed Action and alternatives was compared to baseline conditions to identify any changes.

Monitoring data from stream habitat enhancement projects in and along two other rivers were reviewed to help assess the potential benefits to be expected over time within the Provo River under the Proposed Action and alternatives. Post-restoration monitoring data, including improvements to habitat quality and its subsequent change over time, increases or decrease in trout standing crop, and revegetation of the riparian zone were evaluated. Documented improvements in habitat quality, increases in trout standing crop, and

riparian zone recovery were used to justify the predicted changes in the habitat quality attributes under the Proposed Action and alternatives.

B.2.4.2.1.2 Binns Habitat Quality Index Model II. The Binns HQI Model II was developed as a tool for assessing instream flow needs of trout streams in the Intermountain West. The method involves the collection of standardized stream habitat information (nine habitat quality attributes), rating the attributes from 0 to 4 according to the methodology described in Binns (1982). The data is then scored as the Habitat Quality Index, which represents the potential trout standing crop of a stream in pounds of trout per acre and the stream's carrying capacity if all habitat attributes equal or reach the assigned habitat attribute ratings.

Habitat quality information collected by Woodward-Clyde Consultants in the Provo River were used in the Binns HQI Model II to predict potential impacts of the Proposed Action and alternatives on game fish and their habitat. The following habitat quality attributes were measured or qualitatively estimated. Their designation for use in the Binns Model II calculations is denoted by X_1 through X_{11}:

- Late streamflow (X_1, typically estimated from on-site observations)
- Annual stream flow variation (X_2, typically estimated from on-site observations)
- Maximum summer stream temperature (X_3, measured during August)
- Nitrate-nitrogen (X_4, samples collected during July fish population surveys)
- Fish cover (X_7, includes overhanging vegetation, instream structure)
- Eroding stream banks (X_8)
- Submerged aquatic vegetation (X_9, used to estimate aquatic macroinvertebrate abundance)
- Current velocity (X_{10}, measured using dye)
- Wetted channel width (X_{11}, average of 11 measurements)

The HQI score (Y) was calculated using the Model II algorithm as shown below:

$$\text{Log}(Y+1) = -0.903 + 0.807\text{Log}(X_1+1) + 0.877\text{Log}(X_2+1) + 1.233\text{Log}(X_3+1) + 0.631\text{Log}(F+1) + 0.182\text{Log}(S+1)$$

where $F = (X_3)(X_4)(X_9)(X_{10})$; $S = (X_7)(X_8)(X_{11})$

An example of the calculations involved in the Binns HQI Model II is shown in Table B-1 for the Provo River, Reach 7, baseline conditions.

For this EIS, the Binns Model was used as a predictive tool to estimate potential changes in trout standing crop, given changes in one or more habitat attributes under the Proposed Action and alternatives. For example, providing supplemental instream flows under the Proposed Action would be expected to improve several habitat attributes, such as late summer flows, maximum summer stream temperature and submerged aquatic vegetation. Expected improvements in these attributes would lead to higher ratings for these attributes in the Binns Model and a predicted increase in fish standing crop.

B.2.4.2.2 Non-Game Fish and Their Habitat. Potential impacts on non-game fish and their habitat were analyzed in a similar manner to that described for game fish in Section B.2.4.2.1. The Binns HQI Model II is specific to game fish species (i.e., trout). Interpretation of the results (i.e., changes in certain habitat attribute ratings) for potential effects on non-game fish was done using information on non-game fish species habitat requirements and best professional judgment. The Binns Model results under the Proposed Action and alternatives were compared to baseline conditions. Any changes from baseline conditions were compared to habitat preferences or life history requirements of non-game fish to determine if potential changes in habitat quality would be beneficial or adverse to non-game fish.

Table B-1 Example Calculation of the Habitat Quality Index Score*	
Habitat Attribute	Baseline Rating (0 to 4)
X_1	4
X_2	3
X_3	3
X_4	1
X_7	1
X_8	4
X_9	2
X_{10}	2
X_{11}	2

*Calculation:
Log(Y+1) = -0.903 + 0.807Log(4+1) + 0.877Log(3+1) + 1.233Log(3+1) +
0.631Log((3*1*2*2*)+1) + 0.182Log ((1*4*2)+1)
= 63.3 pounds/acre (predicted trout standing crop)

B.2.4.2.3 Other Aquatic Resources. Potential impacts on other aquatic resources (i.e., amphibians and macroinvertebrates) were analyzed using methods described in Section B.2.4.2.2 for non-game fish and their habitat. Best professional judgment was used to evaluate potential impacts from changes in habitat attributes and habitat quality.

B.2.5 Wildlife Resources Analysis Methodology

This section describes the wildlife resources methodology. A more detailed discussion is presented in the Final Wildlife Resources Technical Report (Mitigation Commission 1997f).

B.2.5.1 Assumptions

The impact analysis for wildlife resources assumed that existing wildlife resources and their habitat will be present when the PRRP is implemented. The assumptions defined in Section B.2.3.1 for wetlands are incorporated into the wildlife resources analysis because the wetlands analysis included potential impacts on vegetation types that comprise available wildlife habitat in the impact area of influence. Of the assumptions made for the wetlands analysis, specifically one is important for the calculation of bird impacts of the Proposed Action: The long-term increase of riparian woodlands along the banks of the restored river would extend from the channel banks into about 50% of the 2-year floodplain. Beneficial impacts on bird populations are based on these calculations of habitat increase. All estimates of bird densities reported to calculate impacts are based on breeding bird counts of one year (1997).

B.2.5.2 Impact Topic Analysis Methods

The overall approach of the analysis was to identify probable wildlife species in the impact area of influence and probable habitat use through existing information. The following were used to describe habitat use:

- The mapping units described in the wetlands analysis (see Section 3.4 of the PRRP Final EIS)

- Non-wetland riparian vegetation and upland woodland habitat

Impacts on game and non-game species and their habitats were analyzed for the Proposed Action and alternatives based on results of the wetlands impact analysis, which quantified impacts on existing vegetative types, and an analysis of construction and operations impacts on riparian vegetation and upland woodlands. Impacts of changes in riparian woodlands on riparian birds, i.e., expected losses or population increases, were calculated using standardized bird survey data of 1997 from UDWR. The entire length of river within the Project Area was covered with a total of 56 circular bird survey plots, in which birds were counted in the morning (6:00 h until 10:00 h) three times during the breeding season (15 May to 15 July). From these observations, relative abundance of birds in the project area were derived and density estimates (number of sightings per acre) calculated. To calculate bird impacts under the Proposed Action, population density estimates for each reach were used to estimate losses in riparian birds. Increases in bird populations were estimated based on bird densities in reference sites that are currently under similar land management and conditions as expected for the Project Area under the Proposed Action. To calculate impacts for the other alternatives, losses or increase were estimated in proportion to the Proposed Action. All other records of wildlife within the Project Area were based on past reports of wildlife sightings to the UDWR.

Wildlife habitat utilization was categorized based on grouping the wetland and non-wetland vegetation into habitat categories of principal importance to most of the species identified. The three habitat categories include:

- Non-riparian wetlands comprised of wet meadow, moist meadow and emergent marsh
- Riparian woodlands comprised primarily of cottonwood, willow and hawthorn trees and associated shrubs
- Upland woodlands comprised primarily of Gambel oak, juniper, sagebrush, serviceberry and upland grasses

B.2.6 Threatened and Endangered Species Analysis Methodology

This section presents the threatened and endangered species resources analysis methodology. A more detailed discussion is presented in the Final Threatened and Endangered Species Technical Report (Mitigation Commission 1997g).

B.2.6.1 Assumptions

The analysis assumed that lack of documented sightings of a particular species does not necessarily mean it is absent from the impact area of influence. Even under optimal survey conditions, a species may be missed, especially if identification relies on certain characteristics (i.e., flowering parts on a plant that does not reproduce every year). For this reason, species presence was assumed if suitable habitat is available and if the species has a high potential to occur in the impact area of influence or was identified during surveys.

For most threatened and endangered (T&E) species, baseline conditions were assumed to be equal to existing conditions.

B.2.6.2 Impact Topic Analysis Methods

The impact topics for T&E species were identified from Section 7 of the Endangered Species Act (ESA). Changes in T&E species under these impact topics between baseline conditions and the Proposed Action and PRRP alternatives were analyzed. Best professional judgment was used to determine if there would be impacts on T&E species from the Proposed Action and PRRP alternatives.

B.2.6.2.1 Peregrine Falcon. The following impact topics were used to determine effects on peregrine falcons.

*B.2.6.2.1.1 **Taking of a Species.*** Take, as defined in the ESA, means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Although loss of habitat is also considered taking of a species under certain circumstances, it is described as a separate evaluation criteria for this analysis. The assessment was based on the potential for an action in an occupied area to take the individual(s) regardless of efforts to avoid the take.

*B.2.6.2.1.2 **Loss of Degradation of Habitat.*** Habitat for T&E species was identified using criteria established in current literature and maps of wetland communities in Heber Valley. The engineering layout of the action alternatives was examined to determine if areas containing habitat would be altered or removed by construction, operation or maintenance. The analysis of habitat for T&E species relied heavily on results of the wetland analysis presented in Section 3.4 of the PRRP Final EIS.

*B.2.6.2.1.3 **Increased Stress, Displacement, or Reduced Reproductive Success.*** The Proposed Action and alternatives were examined to determine if construction, operation or maintenance would indirectly affect T&E species or their habitat. These activities could create increased levels of stress, displacement or reduced reproductive success if located near habitat, especially during sensitive periods such as breeding.

B.2.6.2.2 June Sucker. The June sucker does not exist in the impact area of influence. The PROSIM results (lower Provo River data points) presented in the Final Water Resource Technical Report (Mitigation Commission 1997b) were used to determine that PRRP would not affect June sucker. The analysis was based on estimated changes in flow during spawning.

B.2.6.2.3 Bald Eagle. The impact analysis methods for bald eagle were the same as described in Section B.2.6.2.1 for peregrine falcon.

B.2.6.2.4 Ute Ladies'-tresses. The impact analysis methods for Ute ladies'-tresses were the same as described in Section B.2.6.2.1 for peregrine falcon. In addition, a three-year (1993, 1994 and 1997) survey was completed for Ute ladies'-tresses to determine species presence in the impact area of influence.

B.2.6.2.5 Spotted Frog. The impact analysis methods for spotted frog were the same as described in Section B.2.6.2.1 for peregrine falcon. The methods also included data from a survey by UDWR in 1993 and in cooperation with the Mitigation Commission in 1997 for spotted frog in areas of direct impact and the Provo River corridor in general; a review of recorded sightings from FWS and Utah Division of Wildlife Resources records and publications; and an on-site evaluation of wetland habitats for suitability.

B.2.6.2.6 Other Threatened, Endangered or Candidate Species. The impact analysis methods for all other T&E species were the same as described in Section B.2.6.2.1 for peregrine falcon.

B.2.7 Soil Resources Analysis Methodology

B.2.7.1 Assumptions

Baseline soil conditions are assumed consistent with the characteristics described in the published Soil Survey for the Heber Valley. The soil analysis also assumed flood irrigation in Heber Valley does not cause agricultural runoff and erosion to streams (SCS 1994).

B.2.7.2 Impact Topic Analysis Methods

B.2.7.2.1 Soil Erosion and Stability. .The engineering layouts for the Proposed Action and alternatives were reviewed to identify the location of potential stream channel modifications and where changes to soil resources could occur. Construction-related information from the PRRP engineering team was used to assess potential impact of construction activities on soil erosion. The erosion-related SOPs were reviewed to determine the potential for erosion after the SOPs are implemented.

B.2.7.2.2 Soil Quality. Data from the NRCS were reviewed to describe physical and chemical soil quality characteristics under baseline conditions. Potential changes in the physical composition of the soil from construction activities were assessed by considering such factors as soil stratification, texture and topsoil characteristics. Potential changes in soil chemistry from changes in irrigation practices were assessed by considering such factors as leaching rates and salinity. Changes in soil quality between baseline conditions and the Proposed Action and PRRP alternatives were analyzed to determine potential impacts.

B.2.8 Mineral and Energy Resources Analysis Methodology

B.2.8.1 Assumptions

Energy consumption during construction is assumed to include the energy used by construction equipment, spoil disposal, hauling borrow material, and workers' commuting vehicles. Construction equipment is assumed to consume gasoline at typical rates

B.2.8.2 Impact Topic Analysis Methods

B.2.8.2.1 Mineral Resources. Mineral resource sites in Heber Valley were identified and the amount, type and location of borrow material that would be used under the Proposed Action and PRRP alternatives was determined. The ability of the identified mineral resource site to supply the necessary material was then determined by contacting a local gravel company that could be affected. Construction procedures and results of the transportation analysis were reviewed to determine if the Proposed Action and PRRP alternatives would interfere with or otherwise affect the extraction of minerals from Heber Valley mineral resource sites compared to baseline conditions.

B.2.8.2.2 Energy Use During Project Construction Activities. Typical energy use factors were applied to the construction vehicle and transportation requirements as defined in Chapter 1 of the PRRP Final EIS to estimate the energy that would be used by construction procedures, construction traffic and O&M traffic. A qualitative assessment of the energy that would be used by recreationists was conducted. Changes in energy use between baseline conditions and the Proposed Action and PRRP alternatives were determined.

B.2.9 Air Quality Analysis Methodology

B.2.9.1 Assumptions

The typical emission factors defined by the U.S. Environmental Protection Agency (EPA) and used in this analysis (EPA 1985) are assumed to represent emissions during construction of the Proposed Action and alternatives. The Heber Valley is an air quality attainment area under baseline conditions. A worst-case approach was used by assuming construction vehicles and equipment would be used 8 hours a day and five days a week during construction, not including vehicles used by workers to commute to construction sites. The assumptions used in the transportation analysis (see Section B.2.17) also apply to the air quality analysis because the traffic estimates from the transportation analysis were used in this analysis.

B.2.9.2 Impact Topic Analysis Methods

B.2.9.2.1 Vehicle Emissions During Construction. Heber Valley's status as an attainment area was confirmed and applicable air quality standards were defined by contacting the staff of the Utah Air Quality Board. Baseline conditions were described qualitatively because air quality data for Heber Valley do not exist. Information concerning construction procedures, schedules, vehicles and equipment, and worker traffic was provided by the project engineering team and the transportation analysis. Typical EPA emission factors were defined and applied to determine the maximum emissions that would occur during construction over a

one-year period. The projected air quality impacts of the project were reviewed to determine if the maximum allowable increase limits for attainment areas would be exceeded.

B.2.9.2.2 Emissions From Recreation Traffic. Results of the recreation and transportation analysis were used to assess potential air quality impacts related to the recreation impacts of the Proposed Action and PRRP alternatives. Unlike construction-related air quality impacts, these would not be subject to air quality regulations.

B.2.9.2.3 Dust Emitted From Construction Procedures. The proposed construction procedures and related standard operating procedures (SOPs) were reviewed to assess the potential for dust impacts during construction.

B.2.10 Agriculture Analysis Methodology

B.2.10.1 Assumptions

Permanent impacts from project implementation and management are assumed to result in the permanent loss of agriculture on the affected lands. The cropland in the Provo River Project Area is assumed to be irrigated pasture.

B.2.10.2 Impact Topic Analysis Methods

B.2.10.2.1 Livestock Grazing and Production. Baseline livestock grazing capacity was estimated based on data contained in the U.S. Soil Conservation Service (SCS) Preliminary Investigation Reports. Livestock grazing capacity and production under the Proposed Action and PRRP alternatives was estimated for the Project Area, based on anticipated crop yields reported in the SCS reports. The location of facilities under the Proposed Action and PRRP alternatives was used to identify areas where construction activities and new facilities could result in temporary impacts on livestock grazing patterns, access to water, or other agricultural practices related to livestock grazing.

B.2.10.2.3 Cropland and Crop Production. The existing cropping pattern in the impact area of influence was characterized by using land use data in the UDNR Land Use Inventory Report.

B.2.10.2.4 Agricultural Practices and Operations. The preliminary engineering layout for the Proposed Action and PRRP alternatives was reviewed and used to identify potentially affected grazing land and croplands along with related practices and operations. Potential changes to agricultural practices and operations such as fertilizer and pesticide applications, property access, alterations to facilities and disruptions to livestock grazing patterns were analyzed. Data from the soils discipline were used to assess potential impacts on grazing land and cropland related to soil quality and construction activities.

B.2.10.2.5 Prime Farmlands. Prime farmlands are those that have the best combination of physical and chemical characteristics for the production of agricultural crops (see Glossary for definition of "Prime Farmlands"). Data from the SCS (SCS 1976) were reviewed to determine if prime farmlands are present in the impact area of influence.

B.2.11 Socioeconomics Analysis Methodology

B.2.11.1 Assumptions

This analysis assumed socioeconomic trends already in evidence in Heber Valley will be present under baseline conditions. It is assumed the year 2000 is representative of baseline conditions when potential impacts of the Proposed Action and alternatives are expected to begin.

The assumed prices for barley straw ($35 a ton) and animal grazing units ($10 per AUM) were estimated using Wasatch County budgets from Utah State University (G.D. Miller and E.B. Godfrey 1993) and information provided by Wasatch County Cooperative Extension Service (Wasatch County 1994) and NRCS staff (NRCS 1995). The assumed prices for alfalfa hay ($68.17 a ton), barley ($2.24 a bushel) and oat hay ($54 a ton) were estimated based on data from the U.S. Department of Agriculture, Agricultural Statistics Service (1995).

For this analysis, the local sales tax rates are to be 3 percent of gross retail sales or revenue.

B.2.11.2 Impact Topic Analysis Methods

B.2.11.2.1 Population. Baseline population conditions were defined and potential population impacts were assessed by considering the potential for permanent residents to be attracted by new and permanent employment opportunities or other growth-inducing factors.

B.2.11.2.2 Agricultural Economics. The direct impact on the agriculture sector of the economy is equal to the AUM's taken out of production multiplied by $10 per AUM multiplied by a utilization factor of 70%. The utilization factor indicate the percentage of crop production that is actually utilized and was incorporated into the analysis as per discussions with Natural Resource Conservation Service. For example, under the Proposed Action the direct impact during and after construction is (1916 AUM's)*(.7)*($10/AUM)= $13,412.

B.2.11.2.3 Direct Revenue in Other Sectors. The following sections describe how impacts in other sectors of the economy were estimated.

B.2.11.2.3.1 Land Acquisition. A significant portion of the economic impacts during construction are the result of land acquisition. It is difficult to speculate how land owners will treat this income. For tax purposes, it is probable that most of these funds will be reinvested. As a conservative estimate, it was assumed that only 10 percent of the funds received from land acquisition were reinvested in Wasatch County with the balance invested out-of-county.

B.2.11.2.3.2 Retail and eating and drinking sectors of the economy after construction. Recreationists were assumed to spend $20.91 per angler day on gasoline, other transportation costs, food and beverages. Because of the close proximity to the Wasatch Front, this figure does not include any expenditures for overnight lodging. This figure is from (Bear West 1993) and indexed to 1997 using the Gross Domestic Product Deflator. This angler day expenditure was used to estimate the impact of recreationists on the retail trade and eating and drinking sectors of the Wasatch County economy. Expenditures by recreationists on retail and eating and drinking were assumed to split 50:50 between Wasatch County and out-of-county. Expenditures were then split 25:75 between the eating and drinking sectors and the retail sector.

There is an assumed 80 percent markup on retail goods that is a direct loss out-of-county. For example, under the Proposed Action an additional 96,020 angler days per year will be provided over baseline. Total annual spending will be 96,020 * $20.91 = $2,007,778. Half of this spending will occur in Wasatch County ($2,007,778)*(.5) = $1,003,889. This amount will be spent 25:75 between the eating and drinking and retail sectors respectively; eating and drinking = ($1,003,889)*(.25)= $250,972; retail = ($1,003,889)*(.75)=$752,917. The margin on retail goods is assumed to be 20 percent with the balance a direct loss to the county. In-county retail revenue is = ($752,917)*(.2)=$150,583. Therefore, expenditures by recreationists would increase revenue in the retail and eating and drinking sectors of the Wasatch County economy by $250,972 + $150,583 = $401,556 per year.

B.2.11.2.3.3 Retail and eating and drinking sectors of the economy during construction. All retail spending during construction is assumed to occur within Wasatch County. However, the 20% margin on retail spending described above was assumed. For example, under the proposed action retail sales are expected to

increase $24,000 during the peak construction year. Only 20% or $4,800 is considered a direct impact on Wasatch County as 80% is a direct loss out-of-county.

B.2.11.2.3.4 Labor and Equipment During construction labor and equipment are assumed to be provided 25% in-county and 75% out-of-county. After construction, labor is assumed to be 100% in-county. Local workers are not expected to increase the demand for permanent or temporary residential housing

B.2.11.2.3.4 Indirect Impacts. An input/output model developed by the Utah Office of Planning and Budget was used to estimate the impacts of indirect spending on the economy. For each sector of the economy the model identifies the production input required for a given level of output. Through these interrelationships in the economy, the total direct and indirect impacts on revenue, income and employment can be estimated. The direct impacts described in the prior section were used in the model to identify the indirect impacts that would occur on all sectors of the economy, the changes in income and employment. The input/output model is based on Wasatch and Summit counties because the economy of these two counties are integrated. It is anticipated that the direct in-county impacts and much of the secondary impacts will occur in Wasatch County. The input/output model was developed by the Utah Office of Planning and Budget, the analysis was conducted by Utah Reclamation Mitigation and Conservation Commission staff and contract economists.

B.2.11.2.4 Income and Employment. Direct income and employment for construction, operations and maintenance was calculated by the project engineers. The input/output model calculates indirect changes in income and employment based on direct changes in revenues. Baseline employment and income was estimated for Wasatch County based on data from U.S. Bureau of Economic Analysis (Bureau of Economic Analysis 1994).

B.2.11.2.5 Public Services and Related Fiscal Impacts. Baseline public services and related fiscal conditions were defined based on personal interviews with local officials and planning documents. The SOPs described in Chapter 1 Section 1.9.6 and construction procedures were reviewed to identify which types of public services and agencies might be impacted after the SOPs are successfully implemented. Fiscal impacts related to potential changes in sales were quantified using state and local tax rates.

The impact on property tax revenues was estimated by calculating the average taxable valuation for lands eligible for Farmland Assessment Act (Green Belt). For example, under the Proposed Action up to 688 acres would be acquired. The 1988 FAA Taxable Valuations for Type II Irrigation land is $400/acre, Type III $250/acre and Type IV $175/acre. The total valuation of the 688 acres using the average valuation for Class II through IV irrigated acreage in Wasatch County at $275 per acre is $189,200. The 1997 rate at which these lands are taxed is .008624 and the total taxes that would be collected on the 681 acres is $1,632.

Property tax revenue impacts were adjusted for payments in lieu of taxes that are expected to be available to Wasatch County from the Federal government (BLM 1997). Using a 1997 payment in lieu of taxes rate of $1.29 per acre, a net property tax revenue impact was calculated. It was also confirmed that Wasatch County had not reached its payments in lieu of taxes cap and should, therefore, be eligible for additional payments in the future.

B.2.11.2.6 Housing. The engineering team believes 25 percent of the construction work force would reside locally, with the remainder commuting from Salt Lake City, Provo, Orem, Park City and other nearby communities. Therefore, no additional analysis of potential housing impacts was necessary.

B.2.11.2.7 Economic Benefits The FWS has estimated the regional economic benefit related to increased recreational use using a unit value of $27.07 per angler day (FWS 1996). Economic Benefits are a measure of the net economic value to society of a project. The term "net economic value" is used to emphasize that it is a measure of the value over and above the costs of participating in the recreation activity as were described in Section B.2.11.2.3. Economic benefits provide a measure of the value of a project to society while expenditures provide a measure of the impact of expenditures on the local economy. While

expenditures are important to the local economy they are not considered of measure of the benefits of the project from a national point of view.

The angler day unit value was estimated using the contingent valuation methodology. The contingent valuation method typically involves the use of surveys to estimate people's "willingness to pay" for improved recreational conditions, environmental improvements etc. This technique is usually used to place a dollar value on regional environmental benefits that are difficult to quantify. They can then be compared against the costs of a project in benefit cost analysis. Economic benefits describe that part of the human environment that identify beneficial and adverse effects on the economy of a proposed action and its alternatives (U.S. Water Resources Council 1983).

B.2.11.2.8 Social Impacts. Potentially-affected social groups were defined and described. These groups consist of individuals who would be affected in a similar manner by the Proposed Action and alternatives. The groups often overlap because some individuals have interests and concerns that place them in more than one group. For example, a farmer also may be a recreationist, conservationist or local property owner. Members of each social group would likely experience common impacts on their lifestyles, behavior, attitudes, values and general well-being.

Social impacts were identified and characterized by reviewing detailed descriptions of the Proposed Action and alternatives, findings of other socioeconomics impact topics and results of the agriculture, recreation, noise, health and safety and transportation analyses. The analysis also included a review of the social assessment guidelines of the USFS and U.S. Bureau of Land Management (BLM), and documentation of scoping-related meetings with Heber Valley farmers, land owners and other interested individuals.

B.2.12 Health and Safety

B.2.12.1 Assumptions

The health and safety analysis assumed the transportation, health and safety, air quality and noise SOPs would be successfully implemented. .The flood frequency analysis assumed historic hydrology is representative of future hydrology.

B.2.12.2 Impact Topic Analysis Methods

B.2.12.2.1 Construction Hazards. Hazards related to construction traffic were assessed by using the results of the transportation analysis and reviewing the related transportation SOPs. Other hazards to construction workers and the general public during construction were assessed by reviewing construction procedures for the Proposed Action and alternatives and the health and safety, noise and air quality SOPs. The SOPs were then compared against the USBR safety and health manual (USBR 1993) to determine if they would sufficiently protect workers and the general public.

B.2.12.2.2 Hazards Related to Flooding From Streams and Canals. An analysis was conducted by project engineers to determine the expected frequency of flooding and the area inundated by 2-, 10- and 100-year flood events (flood events that are expected to occur an average of every 2, 10 and 100 years, based on historic hydrology). This information was used to help formulate the Proposed Action and PRRP alternatives, including placement of dikes to contain 100-year flood flows. Potential hazards to people associated with these flood events were identified

B.2.12.2.3 Other Hazards During Operation. The results of the transportation and recreation analyses were reviewed to assess the potential for accidents related to recreation traffic after construction. The maintenance requirements of the Proposed Action and PRRP alternatives also were reviewed

B.2.13 Noise Analysis Methodology

B.2.13.1 Assumptions

The following assumptions were used during the noise analysis:

- Typical noise levels associated with construction activities and defined in the Handbook of Noise Control (Harris 1979), represent the noise impacts of the Proposed Action and alternatives during construction

- The noise mufflers on equipment, structures around pumping stations and other noise muffling measures would be function properly

- Sensitive noise receptors are in the same location under baseline conditions as they are under existing conditions (sensitive receptors are locations especially susceptible to noise impacts, such as schools, hospitals, nursing homes and residences)

B.2.13.2 Impact Topic Analysis Methods

The proposed construction procedures were reviewed to identify activities that would generate noise. Typical construction noise levels were defined by the project engineering team. Project definition maps showing proposed project features were reviewed to determine the proximity of potential construction activities to sensitive noise receptors. The location of recreation traffic that would be generated by the Proposed Action and PRRP alternatives was defined based on a review of the transportation analysis results in Section 3.18 of the PRRP Final EIS. Noise significance criteria were defined and based on studies by the EPA (1971) and CEQ (1970). The projected noise levels associated with the Proposed Action and PRRP alternatives were compared to these criteria to determine the potential for significant noise impacts.

B.2.14 Visual Resources Analysis Methodology

B.2.14.1 Assumptions

It is assumed that the Proposed Action (Riverine Habitat Restoration) and the Existing Channel Modification Alternative would be constructed by reach rather than the entire nine reaches at one time. Construction sequencing is assumed to reduce the amount of visual impacts at any one time. Vegetation is assumed to be established in the upper reaches before the downstream reaches are constructed, limiting short-term impacts to the reach under construction. Cottonwood trees are assumed to take 15 to 30 years to grow to a height comparable with existing mature cottonwoods.

Impacts from the disturbance of vegetation are assumed to be most noticeable during spring, summer and fall months when vegetation is normally colorful and trees and shrubs are foliated. Visual changes from the new channel alignment under the Proposed Action are assumed to be visible year-round because the sinuosity of the river would be most noticeable during winter when the trees are defoliated.

It is assumed that short-term visual impacts are those that would occur during construction of the project and would be reduced as the disturbed areas become revegetated. Long-term impacts are assumed to be permanent changes in the landscape character or those that occur over the duration of the project such as realignment of the river channel under the Proposed Action and alternatives.

B.2.14.2 Impact Topic Analysis Methods

There are no established visual quality objectives or scenic standards for lands not managed by the federal government in Wasatch County. The majority of the land in the PRRP impact area of influence is privately owned, so the evaluation focused on landscape character attributes from middle ground and background views.

The potential for impacts on landscape character attributes was measured by the capability of the landscape to absorb visual alteration without losing its existing character. Existing landscape character attributes include form, line, color and texture. Project-related changes in baseline landscape character attributes were described.

The visual analysis focused on critical viewpoints (locations where a large number of viewers, relative to other viewpoints in the study area, are affected by the project). The critical viewpoints that were used during the analysis are: Highway 40 hillside grade at the north end of the valley looking south, Valley Hills subdivision and Memorial Hill. These viewpoints were chosen for the analysis because they have an elevated view that includes most of Heber Valley from three different perspectives, but most of the minor visual impacts on color, texture, line and landform are not seen from these viewpoints.

In addition to the number of viewers impacted by the project, the analysis considered the expected duration of potential visual impacts, e.g., temporary, construction-related impacts versus permanent visual changes.

B.2.15 Recreation Analysis Methodology

Changes in recreation use were evaluated in terms of changes in angler days because fishing is expected to be the predominant recreation activity associated with the Proposed Action and alternatives. Other types of recreation use such as wildlife viewing, walking, picnicking and cross country skiing might occur in the river corridor and these types of uses were addressed qualitatively.

Angler day use in the Project Area was forecasted by utilizing the estimated use and associated densities on the 5.9 mile section of the Provo River from Deer Creek Dam downstream to the Olmsted Diversion (lower Provo River). It is anticipated that implementation of the Proposed Action would result in a similar fishery and associated angler use in the Project Area as this section of the lower Provo River. This approach was recommended by the Utah Division of Wildlife Resources (UDWR). The methodology for forecasting recreation use on this basis is also outlined in the report, *Forecasting Changes in Site Specific Recreation Use* (USBR 1996).

B.2.15.1 Forecasted Angler Use for the Proposed Action

Fishing on the 5.9 mile reach of the lower Provo River is not controlled through closed access points and current use can only be estimated. Data from the 1989 creel survey of the lower Provo River by the UDWR and from the 1986, 1991, and 1995 Postal Survey of Anglers also by the UDWR was used to forecast angler use in the Project Area. The 1989 creel survey indicated there were approximately 31,783 angler days per year on the 5.9 mile section of the lower Provo River. The Postal Survey of Anglers indicates that angler use has increased at a minimum average annual rate of 8.08% per year since 1986 and more likely at a faster rate from 1991 to 1995. This is consistent with national trends showing an increased interest in fly fishing. Therefore, the estimated angler use in 1995 on the lower Provo River is 50,660 angler days per year. Assuming angler use continued and will continue to grow at a rate approximately equal to the population growth along the Wasatch Front, 2.4% per year, use in the year 2000 is estimated at 57,038 angler days per year on the lower Provo River. The Project Area under the Proposed Action would be approximately 2.03 times the length of the lower Provo River. Applying the estimated level of use on the lower Provo River to the 12 mile reach in the Project Area on a proportionate basis gives a forecasted level of use of 116,009 angler days per year in the Project Area. This level of use would occur over 10 to 15 years as fish populations increase with improvements in habitat. The forecasted use is shown as follows:

Calculation	Description
$(31{,}783)*(1.0808)^{(1995-1989)} = 50{,}660$ angler days per year	1989 estimate of angler days on the 5.9 section of the lower Provo River (31,783 angler days per year) adjusted to 1995 at 8.08 percent per year.
$50{,}660*(1.024)^{(2000-1995)} = 57{,}038$ angler days per year	1995 estimate of angler days on the lower Provo River adjusted to 2000 at 2.4 percent per year.
57,038 angler days * (12 miles/5.9 miles) = 116,009 angler days per year.	Adjusts 2000 estimate of angler use on the lower Provo River to the Project Area on proportionate basis.

B.2.15.2 Forecasted Angler Use for Baseline, Existing Channel Modification and Instream Structures Alternatives

It is anticipated that angler use will be to a large degree a function of angler success. Improvements in aquatic habitat and trout populations are the key features of the Proposed Action and alternatives that are expected to attract additional anglers. Angler use can be estimated for baseline conditions and the other action alternatives by comparing the potential differences in angler success, based on total trout biomass, and applying this difference to the forecasted use for the Proposed Action. These calculations are shown in the following table.

Forecasted Angler Use Under Baseline and PRRP Alternatives

	Total Trout Biomass (lbs)	Forecasted Angler Use[1] (angler days per year)	Change From Baseline[2]	Percent Change from Baseline
Proposed Action	30,458	116,000	96,020	481%
Baseline Conditions	5,246	19,980[3]	na	
Existing Channel Modification	13,150	50,082	30,103	151%
Instream Structures	8,322	31,695	11,715	59%

1 Forecasted use for each alternative equals Trout Biomass as a Percent of Trout Biomass for the Proposed Action * 116,000 angler days per year. For example, forecasted angler use for baseline conditions is (5,246/30,458)* 116,000 angler days/year = 19,980 angler days per year.

2 Change from baseline equals forecasted use - forecasted use under baseline conditions. For example, Change from Baseline for the Proposed Action is 116,000 - 19,980 = 96,020.

3 The estimate for baseline conditions may be understated since providing angler access to the public may be more critical to angler use than the amount of trout biomass and the associated probability of angler success.

B.2.15.3 Estimated Angler Use, Parking Area Capacity Methodology

Two different parking facility capacity scenarios were analyzed and compared to the estimate of angler day use produced by applying lower Provo River densities to the Project Area. In addition to estimating angler day use with a parking capacity approach for comparative purposes, related issues were raised during scoping. The first scenario (Full Utilization) assumed parking areas were fully utilized throughout the course of the week and on a year round basis. The second and more realistic scenario (Typical Utilization) assumed parking facilities were fully utilized on weekends and holidays and not fully utilized during the middle of the week and during cold weather months.

B.2.15.3.1 Full Utilization Scenario. Assuming parking facilities were fully utilized 100% of the time during daylight hours, throughout the course of a week and on a year round basis, 260,000 angler days per year could be supported. This analysis is based on 7 parking areas with an average capacity of 15 vehicles, an average of 1.5 anglers per vehicle and an average length of an angler day of 2.6 hours

B.2.15.3.2 Typical Utilization Scenario. User data from the Green River and Millcreek Canyon recreation provided insight as to how recreation use occurs over the course of a typical week and throughout the year. Using these visitor use patterns, it is estimated that the amount of use in the Project Area would be approximately 99,900 angler days per year. This analysis is also based on 7 parking areas with an average capacity of 15 vehicles, an average of 1.5 anglers per vehicle and an average length of an angler day of 2.6 hours. The peak season of use was June 15 to September 3 and accounts for 35% of the total annual use. Weekend and holiday use was estimated to be 2.5 times the level of mid-week use during this period.

B.2.15.4 Potential Shift in Use From the Lower Provo River to the Project Area

As the fishing improves in the Project Area, it is possible that some of the current fishing pressure on the lower Provo River will shift to the Project Area. However, we believe this shift would be minor and temporary given the close proximity of the lower Provo River to major population centers, the quality of fishing in this area, and the relative scarcity of such resources within close driving distance of the Wasatch Front. Consequently, any additional angling opportunities will be absorbed by excess demand for this type of activity and the shift in use from the lower Provo River to the Project Area was not considered a significant factor and was not analyzed further.

B.2.16 Cultural Resources Analysis Methodology

This section describes the cultural resources analysis methodology. A more detailed discussion is presented in the Final Cultural Resources Technical Report (Mitigation Commission 1997h).

B.2.16.1 Assumptions

The cultural resources analysis assumed that sampling of the impact area of influence in Heber Valley, using limited field assessment, would provide sufficient data to conduct the impact analysis. The analysis also assumed an intensive cultural resources survey would be conducted of areas that would be disturbed by construction before beginning work. A Programmatic Agreement (PA) has been developed between the Utah State Historic Preservation Office (SHPO), Department of the Interior, Mitigation Commission, and the Advisory Council on Historic Preservation (see Appendix F) to guide the intensive cultural resources survey and documentation of survey results.

B.2.16.2 Impact Topic Analysis Methods

B.2.16.2.1 Cultural Resources. Analysis of potential impacts on cultural resources is based on research from pre-existing historical and prehistorical data for the impact area of influence, and limited field sampling

in Heber Valley. The first phase of research involved compiling known archaeological and historic site information and preparing prehistoric and historic overviews of the impact area of influence. These overviews were used as contextual tools for evaluation of recorded and unrecorded cultural resource sites. Existing information was gathered from files of the SHPO, cultural resources files of the Uinta National Forest Supervisor's Office in Provo, and historic files at the CUWCD in Orem. This first phase defined baseline conditions.

The second phase of research involved limited field assessment of selected historic features that could be impacted under the Proposed Action and alternatives. Potential changes to these sites under the Proposed Action and PRRP alternatives were compared to baseline conditions to determine impacts on cultural resources.

B.2.17 Transportation Analysis Methodology

B.2.17.1 Assumptions

The transportation analysis assumed Highways 40, 189 and 113 would be the primary routes used by construction workers and equipment to access construction sites. These highways are shown on Map 1-1 and Map A-1 (see pocket at back of EIS). About 75 percent of the PRRP construction workers are assumed to commute to Heber Valley via Highways 40 and 189. These highways provide access from Salt Lake City (Highway 40) and the Provo/Orem areas (Highway 189). About 25 percent of the workers are assumed to commute from local Wasatch County communities. It was assumed an equal number of workers would come from the Salt Lake City and Provo/Orem areas. It also was assumed that one construction worker per vehicle would travel to the construction sites. A site near Highway 189 and Charleston is assumed be the location of all spoil disposal (waste disposal) during construction. Recreationists are assumed to use Highways 40, 189 and 113 for access to the Provo River.

Baseline traffic estimates were prepared by assuming a 3 percent annual growth rate in traffic would occur each year from 1992 (the last year of historic UDOT data available) to 2000 (the year used to define baseline conditions in this EIS). The annual growth rate is based on historic and projected UDOT traffic data for the impact area of influence (UDOT 1992).

B.2.17.2 Impact Topic Analysis Methods

The estimated construction- and operation-related traffic was compared against baseline traffic estimates to quantify traffic impacts on Highways 40 and 189, the only two roads in the study area for which historic data exist. Traffic impacts on smaller roads were assessed qualitatively and by reviewing results of another EIS study conducted in Heber Valley because historic data were not available to develop baseline traffic estimates.

The project engineering team provided estimates of the total and peak daily traffic that would be generated by construction and O&M activities. The team also identified road crossings and sources of borrow and pipe material.

Baseline conditions on Highways 40 and 189 were established using UDOT's Annual Average Daily Traffic (AADT) data from 1992 (UDOT 1992). These data and projections to the year 2015 were reviewed to determine an annual growth rate of 5 percent. This growth rate was applied to the last year of available historic data (1992) to estimate baseline traffic in the year 2000. An average of the AADT data between affected mileposts was used to define baseline conditions.

Additional UDOT traffic data were collected for Highway 113 and River Road since these roads would be used by PRRP construction vehicles.

Peak daily traffic estimates related to construction and operation of the Proposed Action and PRRP alternatives were applied to the Highway 40 and 189 baseline traffic estimates. The analysis defined the maximum increase in average daily traffic on each highway, given expected construction activities and related assumptions defined in Section B.2.17.1. The assessment of potential impacts on smaller roads was qualitative, based on professional judgment and a review of the transportation SOPs in Section 1.9.6 of the PRRP Final EIS.

Appendix C
Threatened and Endangered Species List

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
LINCOLN PLAZA
145 EAST 1300 SOUTH, SUITE 404
SALT LAKE CITY, UTAH 84115

In Reply Refer To
(CO/KS/NE/UT)

December 9, 1997

Michael C. Weland
Executive Director
Utah Reclamation Mitigation and Conservation Commission
102 West 500 South, #315
Salt Lake City, Utah 84101

Subject: Endangered and Threatened Species List for Provo River Restoration Project, Wasatch County, Utah

Dear Mr. Weland:

The U.S. Fish and Wildlife Service (Service) notes that our previous list of threatened and endangered species potentially affected by the subject project was issued more than 6 months ago. Therefore, the Service hereby provides the following list of threatened and endangered species which may occur in the area of influence of the subject proposed action.

Common Name	Scientific Name	Status
Bald Eagle	*Haliaeetus leucocephalus*	Threatened
June Sucker	*Chasmistes liorus*	Endangered
Peregrine Falcon	*Falco peregrinus*	Endangered
Spotted Frog	*Rana luteiventris*	Candidate
Utah Valvata Snail	*Valvata utahensis*	Endangered
Ute Ladies'-tresses	*Spiranthes diluvialis*	Threatened
Whooping Crane	*Grus americanus*	Endangered

While candidate species have no legal protection under the Endangered Species Act (ESA), we ask that you try to avoid them if they are found in the area.

Your attention is directed to section 7(d) of the ESA, which underscores the requirement that the Federal agency or the applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable and prudent alternatives regarding their actions on any endangered or threatened species.

If further assistance is needed, please contact Dr. Lucy A. Jordan, Wildlife Biologist, of this office at telephone (801) 524-5001.

Sincerely,

Reed E. Harris

Reed E. Harris
Field Supervisor

Appendix D

Environmental Commitments

Appendix D
Environmental Commitments

General

The Mitigation Commission will work in coordination with other agencies to develop appropriate measures to lessen construction impacts on fish and wildlife and their habitats along the river.

Project plans will be designed to reduce or minimize loss of wetlands, large cottonwood trees, sensitive fish and wildlife habitats, and unique plant and animal communities to the extent feasible.

Reconstructed wetlands, newly acquired public lands, recreation access points, and facilities will be constructed in a manner that will meet project goals as well as protect fish and wildlife habitat.

Agricultural

Farm and ranch owners who may be affected by project construction will be notified of construction procedures and schedules to prevent conflicts with agricultural operations. Procedures to avoid conflicts with agricultural operations will be followed during construction to the maximum extent possible. Unavoidable damage to facilities would be replaced or restored during project construction. Farmers and/or landowners who experience additional unavoidable impacts on agricultural facilities and operations would be compensated for their direct cost of moving or reconstructing facilities. The value of agricultural production on lands acquired would be addressed during the land valuation process that would be used to determine the fair market value of the land.

Air Quality

EPA's recommendations for aggregate storage pile emissions (AP-42, Section 11.2.3) will be followed to the extent feasible to minimize dust generated by the project. This will consist primarily of periodic watering of equipment staging areas and dirt roads used during construction.

Construction machinery and maintenance vehicles will be routinely maintained to ensure that engines remain tuned and emission-control equipment is properly functioning as required by law.

Aquatic Resources

Heavy equipment use in stream beds and riparian areas during construction will be minimized to the extent possible. The duration of heavy equipment intrusion into the existing channel will be minimized to the extent possible.

To the extent feasible, construction that causes increases in water turbidity will avoid the brown trout spawning and egg incubation period (October-March).

Access to construction areas by resident fish will be reduced to the extent feasible and stranded fish salvaged and moved to appropriate locations. Salvage and relocation efforts will be coordinated with UDWR.

Impacts on aquatic resources can be avoided and minimized by following hazardous materials procedures included

under the Health and Safety, the Revegetation, Erosion Control and Noxious Weed, and Wetlands Environmental Commitments.

The procedures described in Section 1.5.4 will be applied to minimize sediment entrainment and turbidity resulting from disturbance of the existing channel. Sediment and associated nutrient inputs during the July-September period which could increase blue-green algal blooms in Deer Creek Reservoir would be reduced or avoided by scheduling in-channel work to avoid the July-September and other high-flow periods to the extent possible.

To the extent feasible, appropriate measures will be taken to lessen the impacts from sediment and water turbidity that will occur during construction. These measures may include the use of sediment detention ponds, scheduling construction during dry periods, and development of a sequential construction schedule

A survey will be conducted prior to construction activities to identify leatherside chub populations and their habitats in the Project Area and learn more about the status of the species. The Mitigation Commission will coordinate with the Bonneville Basin Conservation and Recovery Team and its advisors.

Construction of pipeline crossings in stream channels will be scheduled during low flow periods to lessen stream and riparian impacts.

Care will be taken to avoid the escapement of wet concrete into water ways and other sensitive fish and wildlife habitats.

Concrete batch plants will be situated in specific areas away from waterways and sensitive fish and wildlife habitats.

Concrete trucks and equipment will be washed only in specifically designated areas, which will not impact stream or sensitive fish and wildlife habitats.

Parking, storage, and maintenance of equipment and materials used for construction and maintenance will be confined or performed off-site or in designated areas that have little or no value to fish and wildlife

Designs for fish passage facilities will be incorporated in plans for all diversion structures that are modified by the project. The FWS and UDWR will be afforded opportunities to review plans for the fish passage facilities.

Cultural Resources

A detailed site inventory will be conducted for the selected project after the EIS process is completed and before construction is started. This will be conducted by cultural resource experts in areas that would be directly impacted by construction. Data will be recovered and mitigation procedures used when adverse impacts are unavoidable. A Programmatic Agreement among the Department of the Interior, Mitigation Commission, Utah State Historic Preservation Office and The Advisory Council on Historic Preservation was executed July 18, 1997 (Appendix F).

Energy Conservation

Standard energy conservation measures will be used during construction, operation and maintenance, e.g., avoiding unnecessary idling, and keeping vehicles and equipment tuned and maintained.

The shortest possible transportation routes will be used during construction to conserve fuel.

Health and Safety

A contingency plan will be developed to address inadvertent spills of petroleum or other toxic substances. In the event of inadvertent spills of toxic substances, the National Response Center, U.S. Coast Guard Headquarters, Washington, D.C. (telephone 1-800-424-8802) and the Utah Division of Environmental Response and Remediation, 168 North 1950 West, P.O. Box 144840, Salt Lake City, Utah 48114-4840 (telephone 1-801-536-4100) will be promptly notified.

The Utah Occupational Safety and Health Act and the conditions of the federal Occupational Safety and Health Standards will be followed. Copies of these publications and the health and safety Environmental Commitments will be provided to project workers at construction sites.

Warning signs and temporary barriers will be provided in areas used by pedestrians, bicyclists or other recreationists where construction activities are underway.

Onsite and offsite construction and maintenance activities will fully conform with the standards in the USBR safety and health standards manual (USBR 1993). These standards include the following items:

Good housekeeping practices for routine scrap removal from work sites;

Proper handling, storage, use and disposal of toxic materials;

Prohibiting use of alcohol, drugs and firearms;

Restricting public access to work areas to the extent possible;

Providing onsite training to employees exposed to hazards associated with work assignments;

Weekly safety meetings conducted by supervisors for employees under their supervision;

Providing adequate first-aid supplies, trained personnel and emergency evacuation procedures;

Dissemination of information on the hazards of chemicals used, stored or produced in workplaces to employees, contractors, visitors and the public who could potentially be exposed;

Mandatory use of appropriate protective work clothing;

Use of a uniform standard signal system in the operation of cranes, derricks and hoists;

Use of dependable, trained and qualified signal and flag persons wearing high-visibility apparel for traffic control;

Adherence to a detailed fire protection plan (e.g. fuel storage and refueling facilities);

Proper storage of materials used in construction;

Hazardous materials such as explosives, solvents, gasoline, diesel, and lubricants will be stored in safe areas away from waterways and sensitive plant communities and fish and wildlife habitats;

Operation of equipment only by employees qualified to operate the type of equipment assigned;

Providing necessary barricades, walkways, lighting, a public awareness program, and posting for public protection before the start of excavation operations;

The 1995 pre-design Cross Drainage Study will identify the storm runoff potential of local streams and basins for 25- and 100-year flood events. This study identifies both the peak and duration of flows that could occur where project construction will be located. Appropriate modifications will be made to project design and emergency response plans to minimize flood hazards.

Noise

The location of schools, churches, nursing homes, residential areas and other "sensitive receptors" will be considered when scheduling construction activities with significant noise levels.

Mufflers on construction equipment will be checked regularly to minimize noise.

Construction contractors will be required to follow the noise exposure and hearing conservation standards and practices contained in USBR's manual (USBR 1993) to protect potentially exposed project workers and the public from harmful noise levels.

Revegetation, Erosion Control, and Noxious Weeds

Revegetation, Erosion Control and Noxious Weeds Environmental Commitments will be used where project construction would disturb soil. These areas are expected to be along channel construction and modification areas, construction access roads, floodplain grading areas, setback dikes, and stockpile areas. The procedures will be designed to restore vegetation to a desired riparian plant community, and to prevent infestation by noxious plants and to avoid erosion.

In areas subject to erosion, erosion control measures will be implemented to prevent wind and water erosion and help establish vegetation.

A site analysis will be conducted on areas where there is a potential erosion problem, to determine appropriate procedures that are needed (i.e., soil stabilizing materials, seeding mixtures, and mulching and fertilizing treatments).

Noxious weed control is an important component of the PRRP. Construction of the project would disturb a large number of acres, providing an opportunity for noxious weed invasion. Appendix A presents a Noxious Weed Control Plan. Some additional measures are:

Desirable, preferably native, plants that will help control erosion and inhibit the spread of noxious weeds and undesirable plants will be seeded on disturbed areas as soon as possible after construction is completed.

A program to educate contractors and others who are in field position in the identification of noxious or undesirable vegetation will be implemented. The participants will be provided with photographs or drawings of these species, and informed of procedures for reporting locations where they are observed.

Equipment and vehicles will be examined and washed if necessary to reduce the possibility of introducing undesirable plant species from previous work sites into the area.

Noxious weeds and undesirable plants will be controlled by chemical, mechanical, hand removal, and biological means, as may be appropriate, with due consideration given for compatibility with wildlife management plans, needs for protecting native plant communities, and avoidance of environmental contamination. Approved procedures and required permits will be obtained for the controls that are used.

Weeds removed by mechanical or hand control methods will be burned or properly disposed of to prevent their spread to other areas.

Noxious and undesirable vegetation in the vicinity of Ute ladies'-tresses orchid colonies and spotted frog habitats will be controlled by methods that avoid or minimize impacts to these species or their habitats.

Stockpiles of top soil that would remain barren for extended periods will be managed appropriately to control erosion and avoid proliferation and spread of noxious weeds and undesirable plants.

Disturbed areas will be reclaimed to desired riparian, agricultural and upland plant communities as soon as possible after construction. Fish and wildlife habitats would be restored to pre-existing or enhanced conditions. The contractor will be required to use specified plant materials and reclamation techniques, including:

Appropriate revegetation plans will be developed in cooperation with the NRCS, FWS, and UDWR.

Plant species for rehabilitating disturbed areas and for erosion control will be selected on the basis of soil type, root stabilizing characteristics, consistency with composition of contiguous native plant communities, compatibility with wildlife, ability to compete with undesirable vegetation, and compatibility with riparian restoration goals

Topsoil to a depth of one foot (or less if topsoil layer is less than one foot deep) will be removed and stockpiled for site restoration.

As may be needed for revegetating disturbed sites, additional topsoil of suitable quality will be secured from areas that will have minimal impacts on important fish and wildlife habitats.

Areas used for small grains or row crops will be ripped and left bare for the landowner to cultivate and plant at the same time as adjacent farmland.

To maximize the success of revegetation, planting will occur during appropriate climatic periods in properly prepared soil. Planting, watering and fertilizer application techniques will be chosen for specific conditions at each site and the needs of selected plant species. In addition, techniques would be implemented to promote natural recruitment of riparian trees and shrubs. These techniques include producing controlled floods of moderate magnitude, with the appropriate timing, duration, frequency and rate of flow change.

Cottonwood trees in the area of channel changes will be salvaged for use in re-establishing cottonwood trees in riparian areas and to provide materials for fisheries habitat improvements.

Temporary fencing would be erected in areas where livestock or wildlife will likely interfere with successful revegetation and erosion control.

As appropriate, the floodplain will be fenced to allow management of cattle grazing and increase the chance for regrowth of cottonwood trees.

If possible, Jordanelle Reservoir outflows would be managed during the 5 years following construction to promote desired riparian plants and to prevent severe erosion. This would allow riparian and floodplain vegetation to become established until it could provide erosion control. This procedure would be dependent on hydrologic conditions during and after project construction. The Mitigation Commission will coordinate with FWS, UDWR and others to request such flows, if desired, in accordance with the terms and conditions of the Deer Creek Reservoir/Jordanelle Reservoir Operating Agreement.

Threatened and Endangered Species

In order to avoid the likelihood of adverse impacts, the following actions would be incorporated into the Proposed Action and alternatives for the conservation and protection of Ute ladies'-tresses orchid:

A monitoring plan will be implemented for Ute ladies'-tresses orchid approved by the FWS and developed in consultation with the FWS, Mitigation Commission, and Utah Natural Heritage Program (UNHP) staff biologists. The monitoring plan will be part of an overall monitoring plan that will track the success of the project in meeting environmental goals. The monitoring plan will be designed to:

Prior to project implementation

a. Delineate as accurately as possible the location of all colonies in the project area of influence.

b. Determine baseline habitat conditions, specifically hydrology and trends in vegetation.

c. Identify/verify the presence of pollinator species.

Following project implementation

d. Detect changes in habitat conditions, including pollinator habitat, that are considered likely to compromise long term viability of the orchid.

e. Provide a basis for recommendations for remediation and evaluation of success, should that be considered necessary.

f. Determine whether there has been successful dispersal and establishment in newly created suitable habitat.

Prior to construction, the genetics of the Provo River watershed population will be characterized, particularly in relation to other Wasatch Front populations, to help determine the uniqueness of the Provo River population and to determine the biological appropriateness of using seeds or transplanted individuals from other populations to augment colonies or replace lost individuals

following construction and implementation of PRRP.

Direct construction impacts will be avoided. The FWS and the Mitigation Commission will determine an appropriate buffer zone based upon final design and what is encountered during construction. This buffer zone will be surrounded with orange fencing and posted with signs stating "conservation area - do not disturb". The existence of the threatened Ute ladies'-tresses orchid will not be stated on the signs to avoid unwanted attention to the area. The FWS will be notified when fencing has been installed prior to construction and given the option of inspecting the location and adequacy. Additionally, the FWS will be notified when construction will be taking place near orchid colonies. A representative of the Mitigation Commission or the FWS will be present when construction is occurring near orchid colonies in order to ensure that unexpected impacts do not occur and to be available for consultation should changes in construction methods or location appear necessary. Vehicle maintenance, fueling, etc. shall occur only in specified areas located as far away as possible from occupied habitat and where unexpected spills or accidents will not affect occupied or potential habitat. Extreme care shall be taken to avoid contamination of surface or groundwater that flows into or near occupied habitat.

Conditions necessary for continued viability of the Provo River population will be maintained, including "artificial" maintenance of habitat conditions, until such time as the FWS determines that such activities are no longer necessary or warranted. Circumstances that will permit termination of artificial habitat maintenance include documentation of successful establishment of viable colonies and expiration of existing colonies due to circumstances not related to this project. Artificial maintenance may include such actions as augmenting or modifying hydrologic conditions and vegetation management. The Proposed Action has been redesigned to maintain, to the extent possible, existing channel features and hydrology within the occupied habitat. This will help minimize the likelihood that artificial habitat maintenance will be required.

Wetland reconstruction proposed within the abandoned channel of the Provo River in Reaches 7 and 8 under the Proposed Action will likely provide additional suitable habitat for the Ute ladies'-tresses orchid. The wetland protection and enhancement of the 64.7-acre parcel of newly acquired public land on both sides of the Provo River in Reaches 7 and 8 will improve the potential for dispersal of Ute ladies'-tresses orchids by providing additional and more suitable habitat. Additionally, restoration of the river floodplain corridor and to the degree possible river dynamics will help create and maintain suitable habitat. The Mitigation Commission will work with the FWS to design and manage these areas and recreation access points and trails in a manner that will allow establishment and maintain viability of Ute ladies'-tresses orchid colonies.

In order to avoid the likelihood of adverse impacts, the following actions have been incorporated into the Proposed Action and alternatives for the protection and conservation of the bald eagle:

The following measures will be implemented to prevent bald eagles from being harmed by any project-related activity:

a. An individual will be designated as a contact representative who will be responsible for overseeing compliance with the recommendations contained in this biological opinion and provide coordination with the FWS. This individual will ensure that the contractors are made aware of the recommendations in this biological opinion. The representative will have the authority to halt activities of construction equipment that may contravene these recommendations.

b. All project employees will be informed of the occurrence of the bald eagle in the project area, and of the threatened status of the species. They will be advised as to the definition of "take", and the potential penalties (up to $25,000 in fines and six months in prison) for taking a species listed under the Endangered Species Act, and the conservation measures included in the project plan. The FWS and the Mitigation Commission will review the program prior to its implementation.

c. Project related personnel will not be permitted to have firearms in their possession while on the project site.

d. All new temporary or permanent power lines will conform with designs shown in both the Avian Power Line Interaction Committee's (APLIC) 1994 and 1996 publications, "Mitigating Bird Collisions with Power Lines: The State of the Art in 1994," and, "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996," prepared for the Edison Electric Institute/Raptor Research Foundation, Washington, D.C.

The following measures will be implemented to minimize loss, degradation, and fragmentation of bald eagle habitat:

a. Construction activities will be planned to minimize the destruction of mature cottonwood trees within the project area.

b. Cottonwood trees that are in construction right-of-ways will be removed and boles will be salvaged for use in bank reconstruction. In addition to cottonwood establishment through natural processes, planting of bare root stock will be considered. This will reduce the length of time needed to reestablish mature trees.

c. As appropriate, the floodplain will be fenced to allow management of cattle grazing and increase the chance for the regrowth of cottonwood trees.

d. The Mitigation Commission will encourage the Central Utah Water Conservancy District and other entities involved in implementing the Deer Creek Reservoir/Jordanelle Reservoir Operating Agreement to make every effort to coordinate Jordanelle operations to release flows in such a way to maximize habitat and promote conditions that will benefit native vegetation and wildlife, including threatened and endangered species.

e. All construction and maintenance vehicles will stay within the designated construction rights-of-way. Previously disturbed areas (i.e. lacking vegetation) will be used for the parking and storage of equipment and materials. If previously disturbed areas are not available, these activities will be restricted to within the right-of-way.

f. To the maximum extent possible, all vehicle maintenance activities will be conducted in existing maintenance facilities or in previously disturbed areas in the vicinity of the right-of-way. Vehicle maintenance will not be conducted in areas of undisturbed habitat, unless prior approval from the FWS is obtained. Precautions will be taken to ensure that contamination of maintenance sites by fuels, motor oils, grease, etc. does not occur and that such materials are contained and properly disposed of off-site. Inadvertent spills of petroleum based or other toxic substances will be properly contained and contaminated materials properly disposed of.

g. The storage and handling of hazardous materials, such as explosives, solvents, gasoline, diesel, and lubricants will be excluded from the construction zone.

Upon locating dead, injured, or sick bald eagles, immediate notification will be made to the FWS' Division of Law Enforcement, Ogden, Utah at telephone number 801-625-5570 and to the Utah Division of Wildlife Resources, 1115 North Main Street, Springville UT 84663, telephone 801-489-5678. If an injury or death of a bald eagle is related to project impacts, the Mitigation Commission will immediately cease all activities and reinitiate consultation with the FWS as no incidental take is anticipated or authorized.

The Mitigation Commission will provide the FWS with an annual report detailing all bald eagle related activities undertaken due to this project and effectiveness of the conservation measures provided in the project plan.

Transportation

Staging areas for construction material and equipment will be sited to minimize or avoid traffic impacts in residential, commercial, and recreation access areas.

Traffic control and other safety measures in construction and maintenance areas will be followed to minimize the risks of accidents to vehicles and pedestrians during construction and maintenance of the project.

Impacts in areas with significant traffic levels, such as critical intersections and primary arterial roads, will be minimized or avoided to the extent feasible by scheduling equipment transport and material deliveries during off-peak hours. Off-peak hours are those times during any given work day which have traffic volumes less than the highest Annual Average Daily Traffic.

Roads damaged by project construction activities will be restored to at least the level that existed prior to construction.

The shortest possible transportation routes will be used to dispose of spoil and waste.

Construction and traffic control procedures will be designed to allow continued access to businesses and residences.

Construction and traffic control procedures will be designed to minimize the length of detours.

Project personnel will control traffic in affected areas.

Visual Resources

Disturbed areas will be landscaped to match existing and characteristic land forms. When feasible, disturbed areas will be recontoured and slopes rounded along river banks to blend with surrounding natural contours.

New plantings will be blended with natural vegetation at the edges, and will be configured to match existing vegetation patterns and provide horizontal and vertical diversity.

Power poles and other existing facilities would be relocated as necessary to minimize visual impacts on nearby residents.

Water Quality

The Environmental Commitments described for Aquatic Resources also will help protect water quality.

The hazardous materials procedures included under the Health and Safety, and the erosion control Environmental Commitments would help avoid and minimize adverse water quality impacts.

Wetlands

Direct and indirect impacts on wetlands will be avoided, unless there are no other practicable alternatives ("practicable" as defined in 40 CFR 230.3 means capable of being done, after taking into consideration cost, existing technology and logistics in light of overall project purposes).

Procedures to avoid impacts will include protection of wetlands with silt fencing during construction and avoiding quantity and quality impacts on surface water and groundwater resources that serve as a source of water for wetlands.

Project related features will be sited and designed, to the extent feasible, so that they do not contribute to fragmentation of riparian habitats, to minimize losses of mature cottonwood trees and for the protection of fish, wildlife, and plant communities. If feasible, areas of proposed dike removal and breaching will be modified in the field during construction to protect and preserve as much riparian vegetation and wetlands along the existing river corridor as possible.

Areas of heavy construction activity, equipment storage and stockpiling will be selected to minimize impacts on existing riparian vegetation and wetlands.

Heavy equipment in wetland areas will be operated on geotextile mats with gravel overlay to minimize soil and vegetation disturbance.

Materials excavated in the construction of pipeline trenches will not be deposited on wetland or sensitive plant or wildlife habitat areas; this material will be stored on adjacent roadways or in other upland areas to be used later in filling the excavation.

When necessary, construction barriers will be installed to prevent unnecessary construction damage to adjacent wetlands.

Wetland topsoils requiring removal will be stockpiled, replaced, and disturbed areas will be graded to match previous contour elevations.

After wetland topsoils are replaced, the disturbed area will be graded to contour levels that blend with adjacent lands, and revegetated with a mixture of desirable native wetland plant species.

Disturbed wetland areas will be revegetated with a mixture of desirable wetland plant species.

Opportunities will be sought to restore and enhance existing wetlands or to create wetlands within the reconstructed floodplain (under the Proposed Action and Existing Channel Modification Alternative) so they would function and be maintained naturally through connection with the riverine hydrology as a project feature.

Where impacts on wetlands cannot be avoided, impacts will be minimized to the extent possible and mitigation

approaches will be reviewed with the U.S. Army Corps of Engineers (COE).

Opportunities to maximize wetland values within the floodplain area will receive priority in the development of mitigation plans rather than the construction of such features as diversions and dikes for creating new wetlands.

Emphasis on management of project lands that are acquired adjacent to the 2-year flood plain will be on the protection, enhancement or restoration of existing wetlands rather than other uses that are not compatible with this purpose.

Other wetland restoration opportunities to provide high value wetlands protection and management capabilities outside of the immediate project vicinity will be sought if needed to offset impacts and fulfill project purposes

Wildlife Resources

To the extent feasible, the new channel alignment, setback dikes, and maintenance roads will be located and constructed to avoid or minimize the removal of large trees.

To the extent feasible, construction activities on or around important game or non-game species habitat (e.g. deer fawning areas) will be scheduled to avoid the period of greatest use.

To the extent feasible no construction or permanent surface disturbance and occupancy will occur within a 0.5 mile radius of any raptor nest during the crucial breeding season (January 1 through July 15).

To the extent feasible, project-related activities that may disturb nesting of raptors, migratory birds, and riparian-dependent avian species will be scheduled to avoid the active nesting and brooding period

Impacts on wildlife resources also can be avoided and minimized by hazardous materials procedures included under the Health and Safety, the Revegetation, Erosion Control and Noxious Weeds, and Wetlands Environmental Commitments.

In order to avoid, reduce and mitigate potential impacts of the PRRP on spotted frog, the following actions would be incorporated (the implementation of measures marked with an asterisk (*) will be contingent upon receiving the necessary permits from the UDWR):

> * During construction in Reach 9, spotted frogs will be precluded from moving into the "wire ponds" before the ponds are impacted by construction activities. In Reach 9, spotted frogs will be prevented from moving back into the "wire ponds" or entering the construction area. Exclusion will be accomplished by placing drift fences around ponds, and between the construction area and the USBR Jordanelle wetlands areas in Reach 9. Pit-fall traps would be placed along the drift fence prior to fall season and before construction begins. Trapping would be continued in the spring. The traps would be checked at regular, frequent intervals so that captured frogs could be moved to a suitable area. Such trapping and relocation will be in accordance with the protocols described above.

> * During construction, a trained person shall be on-site to coordinate implementation of the Environmental Commitments, identify and resolve problems involving spotted frogs. This action will be performed by personnel trained by qualified professional herpetologists. An accurate record of all activities involving spotted frogs will be maintained in accordance with the approved protocols. As part of this protocol, the Mitigation Commission proposes to mark spotted frogs > 40 mm SVL that

are moved due to construction disturbance with P.I.T. tags to evaluate their movement patterns and survival rates.

* Collection and translocation of spotted frogs will be in accordance with protocols to be developed by the Mitigation Commission and other members of the Bonneville Basin Conservation and Recovery Team and its technical advisors. The protocols will also be reviewed for approval by the UDWR in conformance with the policies, procedures and regulations governing the "Collection, Importation, Transportation or Possession of Zoological Animals."

The Mitigation Commission would document frog use of the existing ponds within the proposed construction corridor in Reach 9 during spring breeding season, summer, and during the periods of retreat into and emergence from hibernation.

Mitigation for the potential removal of two to four "ox bow" type ponds (created by river channelization) along the east side of Reach 9 will be completed. This mitigation is recommended because spotted frog monitoring indicates that these ponds are used by frogs for breeding, summer activity, and herpetologists speculate that these ponds may be hibernation sites. The Mitigation Commission will create four or more new ponds to address known habitat requirements for all spotted frog life stages. At least two of these ponds will be designed and constructed to mimic the two "ox bow" ponds previously identified as suitable for frogs in Reach 9, and at least two additional ponds will be designed and constructed to provide potential hibernation sites.

The Mitigation Commission will monitor the newly constructed and modified ponds for use by spotted frogs for 5 years after construction of each site. It is also recommended that wildlife agencies continue to monitor the sites after this period.

The Mitigation Commission will work cooperatively with USBR and other involved entities to modify water management of several existing mitigation ponds to hold water permanently and improve suitability as hibernation sites.

Monitoring & Reporting

A comprehensive monitoring and reporting program will be developed in cooperation with the U.S. Army Corps of Engineers, UDWR, FWS and other relevant entities that will evaluate and provide information and management guidance on the following:

Revegetation and erosion control areas will be monitored and repairs made if necessary. Revegetated areas will be monitored for invasion of noxious weeds and other weed species, as required by Section 4.17.3 of the Utah Noxious Weed Act, and appropriate weed control measures implemented. These measures will include establishing a cover of desirable plant species as quickly as possible after construction, interim seeding of topsoil stockpiles if they would remain barren for lengthy periods of time, conducting weed surveys during the fall and spring after initial seeding, applying pesticides or removing the weeds by hand before they develop seeds or spread roots, and applying pesticides in accordance with federal application and record-keeping requirements. Monitoring for revegetation success will be conducted for a period of a minimum of 3 years for undeveloped lands following completion of initial revegetation. Appendix A provides the details of a noxious weed control program.

A wetland monitoring plan will be established to evaluate the success of mitigation measures. Such mitigation measures will be modified as needed to ensure successful mitigation. Successful mitigation will be determined

by the appropriate regulatory agencies (i.e., COE, F&WS, NRCS and Utah Division of Wildlife Resources).

Aquatic and terrestrial habitat mitigation.

Aquatic and terrestrial species responses to the project.

Threatened, endangered, and candidate species status and trends.

Appendix E

U.S. Fish and Wildlife Service T&E Consultation Letter

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
LINCOLN PLAZA
145 EAST 1300 SOUTH, SUITE 404
SALT LAKE CITY, UTAH 84115

In Reply Refer To
(CO/KS/NE/UT)

December 10, 1997

Michael C. Weland
Executive Director
Utah Reclamation Mitigation and Conservation Commission
111 East Broadway Suite 310
Salt Lake City UT 84111

Dear Mr. Weland:

This is in response to your May 22, 1996 request for formal Section 7 consultation with the U.S. Fish and Wildlife Service (Service) as required by the Endangered Species Act of 1973 as amended (Act) for the Provo River Restoration Project (PRRP) in Wasatch County, Utah. The Federal action is the approval of funding and implementation of measures to mitigate the environmental impacts of Federal Reclamation Projects.

The Service concurs with the conclusion of your biological assessment that the proposed action would not affect the June sucker (*Chasmistes liorus*), peregrine falcon (*Falco peregrinus*), the whooping crane (*Grus americanus*), or Utah valvata snail (*Valvata utahensis*). The Service further concurs that, based upon the best scientific and commercial information currently available, the PRRP, as briefly described below and as more fully described in the Final Environmental Impact Statement (FEIS), may affect, but is not likely to adversely affect, the Ute ladies'-tresses orchid (*Spiranthes diluvialis*) and the bald eagle (*Haliaeetus leucocephalus*). No critical habitat was designated for these species. Project impacts on the candidate species spotted frog (*Rana luteiventris,* formerly *R. pretiosa*), are addressed in the Fish and Wildlife Coordination Act Report for this project. This response has been prepared in accordance with Section 7 of the Endangered Species Act (16 U.S.C. 1531 et seq.) and the Interagency Cooperation Regulations (50 CFR 402).

This response was prepared using information contained in the May 22, 1996 biological assessment, the draft 1997 final threatened and endangered species technical report for the PRRP FEIS, and draft FEIS prepared by the Utah Reclamation Mitigation and Conservation Commission (Commission). Additional information was provided during the consultation process and obtained from existing Service files.

Project Description

The PRRP Proposed Action (Riverine Habitat Restoration) would reconstruct and realign a majority of the existing river channel and floodplain system between Jordanelle Dam and Deer Creek Reservoir in a meandering riffle-pool sequence to recreate a geomorphically stable river channel. The new channel would be contiguous with the floodplain and will function in dynamic equilibrium with the current valley and hydrologic conditions. Most existing levees would be removed or breached as long as 100-year flood protection is provided by the expanded floodplain or a setback levee. A meandering riffle-pool channel interacting with a functioning floodplain would be developed wherever possible. In some areas, this would be accomplished by incorporating the present channel. In others, the present channel would be abandoned and a new channel alignment developed. Where possible, the river channel would be allowed to migrate within a designated corridor in response to natural variability in hydrologic or geomorphic factors. Disturbed areas along the new floodplain would be initially revegetated with native plants following construction. Side channels and ponds would be incorporated into the design throughout the length of the Provo River between Jordanelle Dam and Deer Creek Reservoir. The Proposed Action would incorporate baseline conditions including seven new recreation access points, contiguous access to the river corridor for recreational fishing and a minimum instream flow of 125 cfs. The Proposed Action would adversely affect some wetland areas, including a portion of the U.S. Bureau of Reclamation (USBR) mitigation wetlands and irrigation-induced wetlands situated along the river that are currently used for livestock grazing and hay production. Some riparian wetlands and riverine habitat would be converted to the new river channel. The Proposed Action will necessitate the acquisition of certain lands. Fencing and/or other measures for limiting livestock grazing will be incorporated into plans for managing the riparian zone. Wetlands affected by the Proposed Action would be replaced with wetland habitat created under the Proposed Action and wetland mitigation.

The Proposed Action would provide for long-term development of a large riparian woodland along the Provo River. Cottonwood galleries probably would develop in the constructed floodplain from controlled flooding events. These cottonwood galleries would provide vertical structure, organic soil development, detrital input to the river, shading, wildlife habitat, diversity and other natural components to the riverine ecosystem. The channels and ponds would provide additional habitat for amphibians, fish and other wildlife.

Under the Proposed Action, the floodplain would receive flood flows every 2 to 5 years and therefore conditions would be favorable for natural regeneration of cottonwood trees, riparian shrubs and other species that are stimulated by periodic scour and deposition of sediments generated from the bed and banks of the river between Jordanelle Dam and Deer Creek Reservoir. The Central Utah Water Conservancy District (District) is responsible for operating Jordanelle Dam. The projected operating regime for Jordanelle Reservoir described in the 1987 Final Supplement to the M&I System Final Environmental Statement was used in the impact analysis for the PRRP. This operating regime will ensure the delivery of minimum streamflows of 125 cfs and provide the periodic flood regime analyzed in the document. Requests to modify the flow

regime in order to provide further floodplain or other environmental benefits, if needed, will be made in accordance with the term and conditions of the Deer Creek Reservoir-Jordanelle Reservoir Operating Agreement.

The Proposed Action would function within the following constraints:

- Controlled hydrology from Jordanelle Dam
- Main roads, bridges and railroad crossings would not be relocated
- Channel realignment would not be constructed closer than 200 feet from residential buildings
- Channel realignment would not require relocation and redesign of the wastewater treatment facility along the river between Heber City and Midway

Effects of the Proposed Action

Ute ladies'-tresses orchid

As described in the biological assessment and FEIS, the Proposed Action will avoid direct impacts and avoid or minimize indirect impacts to colonies of Ute ladies'-tresses orchid known to occur in the Provo River watershed. The colonies are located within segments designated in the PRRP FEIS as Reach 5 and Reach 8 of the Provo River corridor.

The habitat where the Ute ladies'-tresses orchid colonies have been documented results from the dynamic nature of the Provo River channel and floodplain. High water scours these side channels occasionally and prevents the establishment of thick willow cover. In addition, moist soils are present throughout the growing season due to high groundwater levels within the river floodplain in these areas. Ute ladies'-tresses orchids are generally found in open-canopied riparian or wet meadow areas that remain moist throughout the growing season. The Proposed Action has been modified from its original configuration in these reaches to avoid direct construction impacts to orchid colonies as well as avoid or minimize changes to the hydrology which maintains suitable habitat in and near the occupied area.

As analyzed in the biological assessment, cumulative impacts to Ute ladies'-tresses orchid will mostly consist of further modification of already degraded or altered wetlands throughout the Heber Valley area. A total of 79.5 acres of potential Ute ladies'-tresses orchid habitat would be permanently removed during construction. These areas provide potential, but marginal, habitat for the orchid, and the species is not currently known to occur on these sites.

The Proposed Action could have a long-term beneficial effect on Ute ladies'-tresses orchid by creating and improving types of habitat throughout the river corridor that the species appears to prefer. This would include the creation or enhancement of a total of 279.3 acres of active floodplain and other suitable Ute ladies'-tresses orchid habitat, which would offset any permanent habitat losses. The net gain in Ute ladies'-tresses orchid potential habitat would be 199.8 acres.

A substantial benefit of the Proposed Action would be the restoration of geomorphically stable floodplain features along with reinitiation of natural fluvial processes. These conditions should promote development of not only more, but also more suitable habitat for Ute ladies'-tresses orchid.

In order to avoid the likelihood of adverse impacts, the following actions have been incorporated into the Proposed Action for the protection and conservation of Ute ladies'-tresses orchid:

1. A monitoring plan will be implemented for Ute ladies'-tresses orchid approved by the Service and developed in consultation with Service, Commission, and Utah Natural Heritage Program (UNHP) staff biologists. The monitoring plan will be part of an overall monitoring plan that will track the success of the project in meeting environmental goals. The monitoring plan will be designed to:

   <u>Prior to project implementation</u>

   a. Delineate as accurately as possible the location of all colonies in the project area of influence.

   b. Determine baseline habitat conditions, specifically hydrology and trends in vegetation.

   c. Identify/verify the presence of pollinator species.

   Following project implementation

   d. Detect changes in habitat conditions, including pollinator habitat, that are considered likely to compromise long term viability of the orchid.

   e. Provide a basis for recommendations for remediation and evaluation of success, should that be considered necessary.

   f. Determine whether there has been successful dispersal and establishment in newly created suitable habitat.

2. Prior to construction, the genetics of the Provo River watershed population will be characterized, particularly in relation to other Wasatch Front populations, to help determine the uniqueness of the Provo River population and to determine the biological appropriateness of using seeds or transplanted individuals from other populations to augment colonies or replace lost individuals following construction and implementation of PRRP.

3. Direct construction impacts will be avoided. The Service and the Commission will determine an appropriate buffer zone based upon final design and what is encountered during construction. This buffer zone will be surrounded with orange fencing and posted with signs stating “conservation area - do not disturb”. The existence of the threatened Ute ladies'-tresses orchid will not be stated on the signs to avoid unwanted attention to the area. The Service will be notified when fencing has been installed prior to construction and given the option of inspecting the location and adequacy. Additionally, the Service will be notified when construction will be taking place near orchid colonies. A representative of the Commission or the Service will be present when construction is occurring near orchid colonies in order to ensure that unexpected impacts do not occur and to be available for consultation should changes in construction methods or location appear necessary. Vehicle maintenance, fueling, etc. shall occur only in specified areas located as far away as possible from occupied habitat and where unexpected spills or accidents will not affect occupied or potential habitat. Extreme care shall be taken to avoid contamination of surface or groundwater that flows into or near occupied habitat.

4. Conditions necessary for continued viability of the Provo River population will be maintained, including "artificial" maintenance of habitat conditions, until such time as the Service determines that such activities are no longer necessary or warranted. Circumstances that will permit termination of artificial habitat maintenance include documentation of successful establishment of viable colonies and expiration of existing colonies due to circumstances not related to this project. Artificial maintenance may include such actions as augmenting or modifying hydrologic conditions and vegetation management.

5. The Proposed Action has been redesigned to maintain, to the extent possible, existing channel features and hydrology within the occupied habitat. This will help minimize the likelihood that artificial habitat maintenance will be required.

6. Wetland reconstruction proposed within the abandoned channel of the Provo River in Reaches 7 and 8 will likely provide additional suitable habitat for the Ute ladies'-tresses orchid. The wetland protection and enhancement of the 64.7-acre parcel of newly acquired public land on both sides of the Provo River in Reaches 7 and 8 will improve the potential for dispersal of Ute ladies'-tresses orchids by providing additional and more suitable habitat. Additionally, restoration of the river floodplain corridor and to the degree possible river dynamics will help create and maintain suitable habitat. The Commission will work with the Service to design and manage these areas and recreation access points and trails in a manner that will allow establishment and maintain viability of Ute ladies'-tresses orchid colonies.

Several of these conservation measures have already been initiated or completed by the Commission. Suitable habitat for Ute ladies’-tresses orchid throughout the project area has been

surveyed annually, resulting in the discovery of new colonies in Reach 5. Genetic evaluation has been completed.

Bald Eagle

The Proposed Action would result in the removal of an estimated 973 mature cottonwood trees that provide roosting habitat for the bald eagle. A total of 13.3 acres (4.2%) of riparian woodland would be permanently removed. Long-term effects include the possible creation of an estimated 251.0 acre riparian woodland within 25 to 30 years for a net increase of 237.7 acres (+75%). This would occur on the banks and in the active floodplain of the new river channel. Additional improvements and benefits to riparian vegetation and floodplain features may be achieved if Jordanelle Reservoir can be operated to maximize these benefits. Requests to operate the reservoir for those purposes, if made by the Commission, would be made in accordance with the Deer Creek Reservoir-Jordanelle Reservoir Operating Agreement and in coordination with the Service, Utah Division of Wildlife Resources, District, and other involved parties.

Bald eagle use of this portion of the Provo River corridor for winter roosting is occasional. The area is not an important roost site. During construction the eagles would be displaced to alternate roost sites such as Spring Creek and Lake Creek where bald eagles are reported to roost. These areas and additional nearby drainages along the Wasatch Front are available as alternative winter roost sites until such time as cottonwood plantings and natural regeneration reach sufficient size.

In order to avoid the likelihood of adverse impacts, the following actions have been incorporated into the Proposed Action for the protection and conservation of the bald eagle:

1. The following measures will be implemented to prevent bald eagles from being harmed by any project-related activity:

    a. An individual will be designated as a contact representative who will be responsible for overseeing compliance with the recommendations contained in this biological opinion and provide coordination with the Service. This individual will ensure that the contractors are made aware of the recommendations in this biological opinion. The representative will have the authority to halt activities of construction equipment that may contravene these recommendations.

    b. All project employees will be informed of the occurrence of the bald eagle in the project area, and of the threatened status of the species. They will be advised as to the definition of "take", and the potential penalties (up to $25,000 in fines and six months in prison) for taking a species listed under the Endangered Species Act, and the conservation measures included in the project plan. The Service and the Commission will review the program prior to its implementation.

c. Project related personnel will not be permitted to have firearms in their possession while on the project site.

d. All new temporary or permanent power lines will conform with designs shown in both the Avian Power Line Interaction Committee's (APLIC) 1994 and 1996 publications, "Mitigating Bird Collisions with Power Lines: The State of the Art in 1994," and, "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996," prepared for the Edison Electric Institute/Raptor Research Foundation, Washington, D.C.

2. The following measures will be implemented to minimize loss, degradation, and fragmentation of bald eagle habitat:

a. Construction activities will be planned to minimize the destruction of mature cottonwood trees within the project area.

b. Cottonwood trees that are in construction right-of-ways will be removed and boles will be salvaged for use in bank reconstruction. In addition to cottonwood establishment through natural processes, planting of bare root stock will be considered. This will reduce the length of time needed to reestablish mature trees.

c. As appropriate, the floodplain will be fenced to allow management of cattle grazing and increase the chance for the regrowth of cottonwood trees.

d. The Commission will encourage the District to make every effort to coordinate Jordanelle operations to release flows in such a way to maximize habitat and promote conditions that will benefit native vegetation and wildlife, including threatened and endangered species.

e. All construction and maintenance vehicles will stay within the designated construction rights-of-way. Previously disturbed areas (i.e. lacking vegetation) will be used for the parking and storage of equipment and materials. If previously disturbed areas are not available, these activities will be restricted to within the right-of-way.

f. To the maximum extent possible, all vehicle maintenance activities will be conducted in existing maintenance facilities or in previously disturbed areas in the vicinity of the right-of-way. Vehicle maintenance will not be conducted in areas of undisturbed habitat, unless prior approval from the Service is obtained. Precautions will be taken to ensure that contamination of maintenance sites by fuels, motor oils, grease, etc. does not occur and that such materials are contained and properly disposed of off-site. Inadvertent spills of petroleum based or other

toxic substances will be properly contained and contaminated materials properly disposed of.

g. The storage and handling of hazardous materials, such as explosives, solvents, gasoline, diesel, and lubricants will be excluded from the construction zone.

This letter does not constitute an authorization for take of listed migratory birds under the Migratory Bird Treaty Act, the Bald Eagle Protection Act, the ESA, or any other Federal statute.

Upon locating dead, injured, or sick bald eagles, immediate notification must be made to the Services' Division of Law Enforcement, Ogden, Utah at telephone number 801-625-5570 and to the Utah Division of Wildlife Resources, 1115 North Main Street, Springville UT 84663, telephone 801-489-5678. Instructions for proper care, handling, transport, and disposition of such specimens will be issued by the Services' Division of Law Enforcement. If an injury or death of a bald eagle is related to project impacts, the Commission must immediately cease all activities and reinitiate consultation with the Service as no incidental take is anticipated or authorized.

The Commission will provide the Service with an annual report detailing all bald eagle related activities undertaken due to this project and effectiveness of the conservation measures provided in the project plan.

Conclusion

This concludes our response on the Provo River Restoration Project. This response was based on information in the biological assessment, draft FEIS describing the project plan and conservation measures, draft final threatened and endangered species technical report, information in Service files, and discussions with project planners and environmental evaluators. As required by 50 CFR 402.16, reinitiation of formal consultation is required if: 1) new information reveals effects of the agency action that may impact listed species or critical habitat in a manner or to an extent not considered in this consultation, 2) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this opinion, or 3) a new species is listed or critical habitat designated that may be affected by the action.

Sincerely,

Reed E. Harris

Reed E. Harris
Field Supervisor

cc: Program Director, CUP Completion Act Office, Provo, Utah (Attn: Ron Johnston)

Appendix F

Cultural Resources Programmatic Agreement

PROGRAMMATIC AGREEMENT AMONG

THE UNITED STATES DEPARTMENT OF THE INTERIOR,

THE UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION,

THE UTAH STATE HISTORIC PRESERVATION OFFICER,

AND THE ADVISORY COUNCIL ON HISTORIC PRESERVATION,

REGARDING THE PROPOSED PROVO RIVER RESTORATION PROJECT

WHEREAS, the United States Department of the Interior (DOI) has responsibilities and authorities for carrying out the provisions of the Central Utah Project Completion Act of 1992, including funding, oversight of all activities and approval of all documents related to the National Environmental Protection Act, and compliance with Section 106 of the National Historic Preservation Act (16 U.S.C. 4070 (the Act) for the Provo River Restoration Project (PRRP); and

WHEREAS, the DOI and the Utah Reclamation Mitigation and Conservation Commission (Mitigation Commission), an agency created by Congress and acting as Joint Lead Agency with the DOI for preparation of an Environmental Impact Statement pursuant to Section 301 of the Central Utah Project Completion Act (Title III of Public Law 102-575, 106 Stat. 4605, October 30, 1992), have determined that PRRP may have an effect upon properties included in, determined eligible for, and potentially eligible for the National Register of Historic Places (National Register), and have consulted with the Department of the Interior, the Utah State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (Council) pursuant to 36 CFR Part 800, regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f); and Section 110(f) of the same Act (16 U.S.C. 470h-2[f]) and

WHEREAS, the Mitigation Commission will act as lead agency for all Federal agencies involved in implementing this project; and

WHEREAS, the Mitigation Commission and DOI have elected to comply with Section 106 of the Act through execution and implementation of a Programmatic Agreement (PA) pursuant to 3)6 CFR Sec. 800.13 to facilitate decision making regarding the final alternative for the project and to streamline the review process for the identification, evaluation, and treatment of historic properties; and

NOW, THEREFORE, the Mitigation Commission, the DOI, the SHPO, and the Council agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on cultural properties.

STIPULATIONS

DOI shall ensure that the Mitigation Commission carries out the following stipulations:

1. Identification of Historic Properties

   A. The Mitigation Commission will determine the Area of Potential Effect (APE) for the project in consultation with the Utah SHPO in accordance with 36 CFR 800.2(c). In order to define the APE, the Mitigation Commission will identify potential interested persons and seek information from them related to the under-taking's effect on historic properties. As part of this effort, the Mitigation Commission will consult with Indian tribal groups to determine if the project might affect properties of cultural or religious significance to them. In defining the APE, the Mitigation Commission will consider potential direct, indirect, and cumulative effects to historic properties and their historic contexts, including visual and audible effects.

   B. The Mitigation Commission shall conduct a historic property survey of the APE to identify historic properties in a manner consistent with the *Secretary of the Interior's Standards and Guidelines for Identification* (48 CFR 44720-23) and taking into account NPS publication, *The Archeological Survey: Methods and Uses* (1978 GPO stock 9024-016-0009 1) and guided by *National Register Bulletin 38, Guidelines for Evaluating and Documenting Traditional Cultural Properties.* The survey methods will take into account problems with the surface being obscured, such as through the recent deposition, stream modifications or agricultural practices. In such cases, shovel tests or other techniques will be proposed. The Mitigation Commission will inventory the APE regardless of surface ownership to identify all classes of properties of the historic and prehistoric periods included in or eligible for the National Register of Historic Places or that meet the National Register Criteria (36 CFR Sec. 60.4). In consultation with Indian tribal groups, the Mitigation Commission will identify properties of cultural or religious significance to them.

   C. The Mitigation Commission, in consultation with the Utah SHPO, shall evaluate properties identified in the survey in accordance with 36 CFR 800.4. If properties included in or eligible for the National Register of Historic Places or meeting the National Register Criteria (36 CFR 60.4) are identified, the Mitigation Commission shall comply with 36 CFR 800.5.

   D. The Mitigation Commission shall provide site forms and a report resulting from this project to the Utah SHPO in a form acceptable to the Utah SHPO for inclusion in their database.

   E. The Mitigation Commission shall ensure that historic properties are adequately evaluated and archaeologically tested to determine their eligibility to the National Register of Historic Places as per the guidelines in Appendix A of the Agreement.

II. Treatment Plans for Historic Properties

A. Standards for Treatment Plans:

The preferred treatment alternative is avoidance of effects on historic properties project relocation or redesign. When avoiding adverse effects is not feasible or prudent the Mitigation Commission will develop and implement Treatment Plans to minimize or mitigate such effects on historic properties. The Mitigation Commission will develop Treatment Plans for the largest possible area affected by the project that is acceptable to the Mitigation Commission and Utah SHPO. The Treatment Plans will be consistent with the principles in Part I recommendations in Part II of the Council's *Treatment of Archaeological Properties: Handbook* (Appendix B of this Agreement) and the *Secretary of the Interior's Standard and Guidelines for Archaeology and Historic Preservation* (Federal Register, Vol. 4 No. 190, September 29, 1983), pp. 44716-44742) (Appendix C of the Agreement). Treatment Plans will take into account existing information to the maximum degree possible. The Mitigation Commission will consult with interested members of the public in developing and implementing treatment plans, particularly with Indian tribal groups regarding historic properties of traditional cultural or religious significance to them. Treatment Plans will be developed in accordance with the following:

B. Contents of Treatment Plans will include, but not be limited to:

1. Specification of all historic properties to be affected by the project for which the effects are proposed to be avoided, including a description of properties an reasons for which the properties are included in or eligible for inclusion in the National Register of Historic Places or meet the National Register Criteria and a description of the proposed project redesign or relocation to avoid effects;

2. Specification of all historic properties or portions of properties to be affected by the project, including a description of such effects, a description of the reasons for which properties are included in or eligible for the National Register of Historic Places or meet the National Register Criteria, and an explanation of the treatment proposed and Justification for the chosen treatment alternative;

3. Specification of all historic properties that will be affected by the project for which no treatment is proposed, including a description of the reasons for which they are included in or eligible for the National Register of Historic Places or meet the National Register Criteria, a description of the effects of the project on the properties, and a justification or rationale for not proposing any treatment to the historic properties;

4. Specification of all historic properties of cultural or religious significance to Indian tribal groups that will be affected by the project, including a description of the properties, an explanation of the treatments proposed, evidence of consultation with the

involved tribal group, and justification of alternative treatments proposed;

5. An Archaeological Research Design; For historic properties eligible for the National Register under criterion D (36 CFR 60.4) and for which archaeological data recovery is the proposed treatment, the Mitigation Commission will develop an Archaeological Research Design that specifies and explains the research questions to be answered by the data recovery efforts, the data needed to answer the questions posed including the sites and portions of sites to be investigated, and the methods to be used to address the research questions posed. The Mitigation Commission will develop data recovery plans that are acceptable for each historic property subject to data recovery. Acceptable treatment options may include sampling of archaeological sites that contain repetitive data and/or concentrating data recovery on sites or portions of sites that may yield the most significant information about history or prehistory of central Utah. In addition, the Mitigation Commission will provide explanations or justifications for the reasons for and appropriateness of the chosen research questions, data needs, specific sites or portions of sites proposed for data recovery, and methods proposed.

6. Construction Monitoring and Open-Trench Inspection; The Mitigation Commission will develop a plan for monitoring construction and inspecting open trenches within the project area that are likely to contain historic properties included in or eligible for the National Register of Historic Places but that are buried sufficiently to prevent their identification at the survey stage (cf. Subsection I.B., above). In the plan, the Mitigation Commission will specify the areas proposed for construction monitoring and open-trench inspections, justify why the areas are proposed, describe how the monitoring, and inspection will be carried out (including, but not limited to, what archaeological evidence will be sufficient to result in a request for construction work stoppage), describe the historic properties expected to be found and their archaeological or cultural or religious significance, and explain and justify treatments proposed for all historic properties potentially identified through the monitoring or inspection by types or classes of prehistoric sites or other historic properties (e.g., functional or morphological or cultural or temporal affiliation, etc.). In the plan, the Mitigation Commission also will specify how the archaeologist and construction personnel will work together.

C. Review of Treatment Plans

The Mitigation Commission shall afford the Council and the Utah SHPO 15 working days to review Treatment Plans. The Mitigation Commission shall implement the Treatment Plans after completion of the review process, including all revisions to the plans resulting from the review process. If the Council or Utah SHPO disagree with the Treatment Plans or the project's potential effects on a historic property included in or eligible for the National Register, the Mitigation Commission and DOI will seek to resolve the objection in accordance with stipulation X below. Cover letters - transmitting Treatment Plans will inform the signatories that the Plans are being forwarded in accordance with this Agreement, which provides for review within 15 working days.

III. Conduct of Construction Monitoring and Open-Trench Inspections

The Mitigation Commission will ensure that construction activities that could affect a historic property are stopped until the Mitigation Commission, in consultation with the Utah SHPO, determines the National Register eligibility of the property as per 36 CFR 60.4. Also, National Register eligibility will be determined consistent with the research questions outlined in the archaeological research design (subsection II.B.5., above) and the construction monitoring and open-inspection portion of the Treatment plan (subsection II.B.6., above). The Mitigation Commission will record properties identified during the monitoring or open-trench inspections to a level sufficient to allow determinations of whether a property meets the National Register Criteria (36 CFR Sec.60.4). Emergency consultations or a meeting will be held within five working days of the discovery of the property. If the property is determined to be eligible for the National Register, the Mitigation Commission and the Utah SHPO will decide on a course of treatment consistent with the recommendations in the Treatment Plan. All construction monitoring and open-trench inspections will be carried out by qualified professional archaeologists as per stipulation IX, below. All construction monitoring and open-trench inspections and treatment of historic properties identified as the result of such monitoring and inspections will be carried out in such a way as to minimize or avoid delays to construction to the extent feasible and prudent.

IV. Reporting on the Investigations of Historic Properties

A. The Mitigation Commission shall ensure that draft reports resulting from actions pursuant to this Programmatic Agreement will be provided to the signatories for review prior to their final acceptance by the Mitigation Commission. The Mitigation Commission shall ensure that all such reports are responsive to contemporary professional standards, and to the *Department of the Interior's Format Standards for Final Reports of data Recovery Program* (42 CFR 5 3 77-79). The Mitigation Commission will take into account the comments provided by the signatories in preparing the final reports. The Mitigation Commission will then submit final reports to all signatories, the National Technical Information Service, and local libraries to be determined in consultation with the Utah SHPO. The Mitigation Commission may provide precise locational data only in a separate appendix if it appears that its release could jeopardize the archaeological sites.

B. The Mitigation Commission will develop a single formal report that describes and analyzes all aspects of survey, testing, and evaluation of historic properties. The Mitigation Commission will develop a second formal report that describes and analyzes the treatment of historic properties. The Mitigation Commission will develop a third formal report that describes and analyzes all aspects of the monitoring of construction and open-trench inspection, evaluations of properties identified through the monitoring and inspection, and all treatment of such properties. Finally, the Mitigation Commission will develop a final project report that synthesizes all work undertaken pursuant to this Agreement and the results of such work. The Mitigation Commission will develop all reports and submit them for review to the signatories to this Agreement according to a

schedule developed by Mitigation Commission and the Utah SHPO. The Mitigation Commission will work out the format, content, and scheduling of the reports in consultation with the Utah SHPO.

V. Evaluation of Historic Properties After Completion of the Historic Preservation Work

The Mitigation Commission will nominate historic properties to the National Register of Historic Places if those properties are evaluated as particularly unique or significant through consensus decision between the Mitigation Commission and the Utah SHPO, after completion of all other work called for in this Agreement.

VI. Policy on Landowner Denial of Access for Historic Preservation Work

The Mitigation Commission will identify, evaluate, and treat historic properties included in or eligible for the National Register in accordance with this Agreement regardless of surface ownership. Should access be denied to any non-Federal lands to carry out the requirements of this Agreement, the Mitigation Commission will take all reasonable steps to obtain such access. Should further efforts fail to obtain access, the Mitigation Commission will consult with the Utah SHPO and the Council in accordance with 36 CFR 800.4 to determine what steps, if any, must be taken to satisfy the intent of this Agreement. Until such consultation is complete, no party in the dispute will take or sanction any actions that would or could have an adverse effect on a historic property that may be located on the property to which access has been denied.

VII. Curation

All collected cultural materials will be stabilized, labeled, and catalogued. The Mitigation Commission will curate materials in accordance with 36 CFR Part 79 by the Utah Museum of Natural History at the University of Utah in Salt Lake City, or other authorized Utah curation facility. The disposition of cultural materials from private lands will be determined by the landowner, after all analysis is complete. If the landowner wishes the materials to remain in government possession, they will be curated in accordance with 36 CFR Part 79 as outlined above.

VIII. Human Remains

The Mitigation Commission will develop a plan for the treatment of human remains in consultation with Indian tribal groups having concerns about the project area. The Mitigation Commission will comply with the Native American Graves Protection and Repatriation Act (NAGPRA). If human remains are located during implementation of all work in the vicinity of the remains will be stopped immediately and involved Indian tribal groups will be contacted.

IX. Personnel Qualifications

Professionals carrying out the terms of this Agreement will have appropriate expertise and

qualifications as outlined in the *Secretary of the Interior's Professional Qualification Standards for Archaeology and Historic Preservation* (48 FR 44738-9).

IX. Dispute Resolution

Should any party to this Agreement have an objection regarding the implementation of this Agreement, the Mitigation Commission shall consult with the objecting party to resolve the objection. If the objection cannot be resolved through consultation, DOI shall forward all documentation relevant to the objection to the Council, including the Mitigation Commission's and DOI's proposed response to the objection. Within 30 days after receipt of all pertinent documentation, the Council shall exercise one of the following options:

A. Provide the Mitigation Commission and DOI with recommendations, which DOI shall take into account in reaching a final decision regarding its response to the objection; or

B. Notify the Mitigation Commission and DOI that the objection will be referred for comment pursuant to 36 CFR 800.6 (b), and proceed to refer the objection and comment. The resulting comment shall be taken into account by DOI in accordance with 36 CFR 800.6(c)(2) and Section 110(l) of the Act.

XI. Failure to Carry Out the Terms of this Agreement:

Failure to carry out the terms of this Agreement requires that the DOI or Mitigation Commission on its behalf, again request the Council's comments in accordance with 36 CFR Part 800. If DOI or the Mitigation Commission cannot carry out the terms of this Agreement, no actions shall be taken, or sanctioned that would result in an adverse effect with respect to historic properties which may be included in or eligible for the National Register of Historic Places.

XII. Amendment to this Agreement:

If any of the signatories to this Agreement determines that the terms of this Agreement cannot be met or believes that a change is necessary, that signatory shall immediately request the consulting parties to consider an amendment or addendum to this Agreement. Such an amendment or addendum shall be executed in the same manner as the original Agreement.

Execution of this Programmatic Agreement evidences that Mitigation Commission and DOI have afforded the Council an opportunity to comment on the Provo River Restoration Project and its effects on historic properties, and that Mitigation Commission and DOI have taken into account the effects of the undertaking on historic properties.

IN WITNESS WHEREOF, each party hereto has caused this AGREEMENT to be executed by an authorized official on the day and year set forth opposite their signature below.

UTAH RECLAMATION MITIGATION AND CONSERVATION COMMISSION

By: Don A Christiansen Date: 7-1-97
Title: Don Christiansen, Chairman

DEPARTMENT OF THE INTERIOR, CENTRAL UTAH PROJECT COMPLETION

By: Ronald Johnston Date: 9 July 1997
Title: Ron Johnston, Program Director

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

By: John M Fowler Date: June 13/997

UTAH STATE HISTORIC PRESERVATION OFFICER

By: Max J Evans Date: 7-18-97
Title: State Historic Preservation Officer

APPENDIX A

Evaluation and Testing of Cultural Properties

Preliminary evaluations to determine if subsurface properties are potentially eligible for the National Register will be based on an examination of soil development for depositional situations amenable to the preservation of subsurface archaeological deposits through surface evidence, shovel probing or excavation units. If acceptable to the Federal Agency responsible, in consultation with SHPO, subsurface cultural properties appearing to be eligible for the National Register or to have a soil depositional environment amenable to the preservation of such subsurface archaeological deposits will be considered as eligible to the National Register. Adverse effects to properties determined to be eligible for the National Register in accordance with this subsection or determined eligible under subsections III.C. or III.D., above, in consultation with the SHPO, may be avoided by project relocation where feasible and prudent or excavated to preserve the important archeological data.

The identification, survey and testing information, including the preliminary evaluations resulting from subsection III.B., above, will be reviewed by the Mitigation Commission and the SHPO to determine if such properties are eligible for the National Register. If there is not sufficient information to make such a determination, strategies acceptable to the SHPO for acquiring needed information will be developed and implemented.

If the Mitigation Commission and the SHPO disagree regarding whether cultural properties are eligible for the National Register, the Mitigation Commission will seek a determination of eligibility from the Keeper of the National Register of Historic Places in accordance with 36 CFR Part 63. The Keeper's determination will be considered final for the purposes of this Agreement.

Appendix G

List of Fish and Wildlife Service Recommendations From The Fish and Wildlife Coordination Act Planning Aid Letter

Appendix G

List of Fish & Wildlife Service Recommendations From The Fish & Wildlife Coordination Act Planning Aid Letter

1. To the extent possible, no construction or permanent surface disturbance and occupancy should occur within a 0.5 mile radius of any raptor nest during the crucial breeding season (January 1 through July 15).

2. To the extent feasible, project-related activities that may disturb nesting of raptors, migratory birds, and riparian-dependent avian species should be scheduled to avoid the active nesting and brooding period.

3. Project related features should be sited and designed, to the extent feasible, so that they do not contribute to fragmentation of riparian habitats.

4. The Mitigation Commission should work in coordination with other agencies to develop appropriate measures to lessen construction impacts on fish and wildlife and their habitats along the river.

5. To the extent feasible, construction that causes increases in water turbidity should avoid the brown trout spawning and egg incubation period (October-March).

6. Access to construction areas by resident fish should be reduced to the extent feasible and stranded fish salvaged and moved to appropriate locations. Salvage and relocation efforts will require coordination with UDWR.

7. To the extent feasible, appropriate measures should be taken to lessen the impacts from sediment and water turbidity that will occur during construction. These measures may include the use of sediment detention ponds, scheduling construction during dry periods, and development of a sequential construction schedule.

8. A survey should be conducted prior to construction activities to identify, protect, and improve leatherside chub populations and their habitats and learn more about the status of the species. These efforts should be made in cooperation with state and federal agencies.

9. Topsoil to a depth of one foot (or less if topsoil layer is less than one foot deep) should be removed and stockpiled for site restoration.

10. As may be needed for revegetating disturbed sites, additional topsoil of suitable quality should be secured from areas that will have minimal impacts on important fish and wildlife habitats.

11. Cottonwood trees should be salvaged for use in re-establishing cottonwood trees in riparian areas and to provide materials for fisheries habitat improvements.

12. As appropriate, the floodplain should be fenced to allow management of cattle grazing and increase the chance for regrowth of cottonwood trees.

13. Site analysis should be conducted on areas where there is a potential erosion problem, to determine appropriate procedures that are needed (i.e., soil stabilizing materials, seeding mixtures, and mulching and fertilizing treatments).

14. Silt fences and construction barriers should be erected and maintained during the construction period to reduce the potential for impacts to wetlands.

15. Materials excavated in the construction of pipeline trenches should not be deposited on wetland or sensitive plant or wildlife habitat areas; this material should be stored on adjacent roadways or in other upland areas to be used later in filling the excavation.

16. After wetland topsoils are replaced, the disturbed area should be graded to contour levels that blend with adjacent lands, and revegetated with a mixture of desirable native wetland plant species.

17. Opportunities should be sought to restore and enhance existing wetlands or to create wetlands within the reconstructed floodplain (under the Proposed Action and Existing Channel Modification Alternative) so they would function and be maintained naturally through connection with the riverine hydrology as a project feature.

18. Disturbed areas should be reclaimed and returned to pre-existing or enhanced fish and wildlife habitats as soon as possible after construction.

19. Plant species for rehabilitating disturbed areas and for erosion control should be selected on the basis of soil type, root stabilizing characteristics, consistency with composition of contiguous native plant communities, compatibility with wildlife, and ability to compete with undesirable vegetation. Appropriate revegetation plans should be developed in cooperation with the NRCS, Service, and UDWR. Planting, watering and fertilizer application should be on schedules that are optimal for the species selected.

20. Desirable, preferably native, plants that will help control erosion and inhibit the spread of noxious weeds and undesirable plants should be seeded on disturbed areas as soon as possible after construction is completed.

21. A program to educate contractors and others who are in field position in the identification of noxious or undesirable vegetation should be implemented. The participants should be provided with photographs or drawings of these species, and informed of procedures for reporting locations where they are observed.

22. Equipment and vehicles should be examined and washed if necessary to reduce the possibility of introducing undesirable plant species from previous work sites into the area.

23. Noxious weeds and undesirable plants should be controlled by chemical, mechanical, hand removal, and biological means, as may be appropriate, with due consideration given for compatibility with wildlife management plans, needs for protecting native plant communities, and avoidance of environmental contamination. Approved procedures and required permits should be obtained for the controls that are used.

24. Weeds removed by mechanical or hand control methods should be burned or properly disposed of to prevent their spread to other areas.

25. Noxious and undesirable vegetation in the vicinity of Ute ladies'-tresses orchid colonies and spotted frog habitats should be controlled by methods that avoid or minimize impacts to these species or their habitats.

26. Stockpiles of top soil that would remain barren for extended periods should be managed appropriately to control erosion and avoid proliferation and spread of noxious weeds and undesirable plants.

27. Construction of pipeline crossings in stream channels should be scheduled during low flow periods to lessen stream and riparian impacts.

28. Right-of-ways should be aligned to minimize losses of mature cottonwood trees and for the protection of fish, wildlife, and plant communities.

29. Reconstructed wetlands, newly acquired public lands, recreation access points, and trails should be constructed in a manner that will meet project goals as well as protect fish and wildlife habitat.

30. Care should be taken to avoid the escapement of wet concrete into water ways and other sensitive fish and wildlife habitats.

31. Concrete batch plants should be situated in specific areas away from waterways and sensitive fish and wildlife habitats.

32. Concrete trucks and equipment should be washed only in specifically designated areas, which will not impact stream or sensitive fish and wildlife habitats.

33. Scrap materials should be removed from work sites after construction is completed.

34. To the extent feasible, heavy equipment should not be used in stream beds and riparian areas. If heavy equipment must be used, techniques that will minimize impacts should be utilized.

35. Parking, storage, and maintenance of equipment and materials used for construction and maintenance should be confined or performed off-site or in designated areas that have little or no value to fish and wildlife.

36. Toxic materials should be properly handled, stored, used and disposed of in a safe manner.

37. Hazardous materials such as explosives, solvents, gasoline, diesel, and lubricants should be stored in safe areas away from waterways and sensitive plant communities and fish and wildlife habitats.

38. A contingency plan should be developed in the event of inadvertent spills of petroleum or other toxic substances.

39. In the event of inadvertent spills of toxic substances, the National Response Center, U.S. Coast Guard Headquarters, Washington, D.C. (telephone 1-800-424-8802) and the Utah Environmental Response and Remediation Division, 168 North 1950 West, P.O. Box 144840, Salt Lake City, Utah 48114-4840 (telephone 1-801-536-4100) should be promptly notified.

Project Design and Operation Impacts

40. Project plans should be designed to reduce or minimize loss of wetlands, large cottonwood trees, sensitive fish and wildlife habitats, and unique plant and animal communities.

41. Designs for fish passage facilities should be incorporated in plans for all diversion structures that are modified by the project. The Service and UDWR should be afforded opportunities to review plans for the fish passage facilities.

42. Specific plans for the seven new fishing access points and facilities should be developed and managed in cooperation with the Service and UDWR in the interest of avoiding and protecting sensitive fish and wildlife habitats and native plant communities.

43. Opportunities to maximize wetland values within the floodplain area should receive priority in the development of mitigation plans rather than the construction of such features as diversions and dikes for creating new wetlands.

44. Emphasis on management of project lands that are acquired adjacent to the 2-year flood plain should be on the protection, enhancement or restoration of existing wetlands rather than other uses that are not compatible with this purpose.

45. Other wetland restoration opportunities to provide high value wetlands protection and management capabilities outside of the immediate project vicinity should be sought if these measures are not adequate to offset impacts and fulfill project purposes.

Monitoring and Reporting

46. A comprehensive monitoring and reporting program should be developed in cooperation with the U.S. Army Corps of Engineers, UDWR, Service, recreation groups, and county officials that will evaluate and provide information and management guidance on the following:

    A. Success of revegetation and erosion control measures.
    B. Control of noxious weeds and undesirable plants.
    C. Aquatic and terrestrial habitat mitigation.
    D. Aquatic and terrestrial species responses to the project.
    E. Threatened, endangered, and candidate species status and trends.
    F. Recreation and angler day use and trends.

Appendix H

Spotted Frog Advisory Team
Final Recommendations For
Feasibility Level Restoration Plan Document

Appendix H

Spotted Frog Advisory Team Final Recommendations for Feasibility Level Restoration Plan Development

According to their charge, the Provo River Spotted Frog Advisory Team presents their final feasibility level recommendations to the Utah Reclamation Mitigation and Conservation Commission for spotted frog protection and habitat loss mitigation for the Provo River Restoration Project. These recommendations are a product of several field trips, field observations, meetings and data review. If incorporated into the restoration plan and implemented correctly, these measures should mitigate for potential significant impacts to the Heber Valley spotted frog population due to the Provo River Restoration Project. The team consisted of representatives from the Mitigation Commission, the Utah Division of Wildlife Resources, U.S. Fish and Wildlife Service and other advisors including Dr. Charles Peterson, David Ross, Dr. Elisabeth Ammon, Peter Hovingh, Dr. Jamie Reaser, Stephen Burton, and Dr. Jim Munger.

Recommendations

1) Do not align the restored channel through the center of the old Walker Ranch (in Reaches 7 and 8). This area has diverse wetland habitats and serves as one of two centers of spotted frog activity. Of particular concern is potential impact to the beaver dam complex that has developed in the relic channel on The Nature Conservancy property.

2) Compensate for the potential removal of two to four "ox bow" type ponds (which are not natural but were actually created during river channelization) along the east side of Reach 9 (see map). This mitigation is recommended because spotted frog monitoring indicates that these ponds are used by frogs for breeding, summer activity, and herpetologists speculate that these ponds may be hibernation sites.

    *a) The Commission should document frog use of the existing ponds within the proposed construction corridor in Reach 9 during spring breeding season, summer, and during the periods of retreat into and emergence from hibernation.

    b) Create four or more new ponds to address known habitat requirements for all spotted frog life stages. Construct at least two of these ponds to mimic the two "ox bow" ponds previously identified as suitable for frogs in Reach 9 (see map), and design at least two additional ponds to provide potential hibernation sites.

    c) Modify water management of several existing mitigation ponds to hold water permanently and improve suitability as hibernation sites.

    *d) Monitor the newly constructed and modified ponds for use by spotted frogs for 5 years after construction of each site. It is also recommended that wildlife agencies continue to monitor the sites after this period.

    *e) Exclude frogs from returning to the "ox bow" ponds during fall before the ponds are impacted by restoration construction in Reach 9. Continue frog removal in the following spring. This may be done by placing drift fences around the ponds to be impacted, and between the Provo River and USBR Mitigation Wetlands in Reach 9. Pit fall traps should be placed

along the drift fence to move the frogs across the fence away from the construction corridor.

*f) Mark spotted frogs > 45 mm SVL that are moved due to construction disturbance with P.I.T. tags to evaluate their movement patterns and survival rates.

*g) Identify and solve problems involving spotted frogs during construction. This action should be performed by a biologist trained to handle such problems prior to construction.

* The implementation of these recommendations will be contingent upon receiving the necessary permits from the Wildlife agencies.

Appendix I

404(b)1 Alternatives Analysis

Appendix I
404 (b) (1) Alternatives Analysis
December 1997

I.1 Introduction

The 404 (b)(1) Guidelines (40 CFR 230) are the substantive criteria used in evaluating discharges of dredged or fill material in the waters of the United States under Section 404 of the Clean Water Act, and are applicable to all 404 permit decisions. Subpart B of the Guidelines outlines restrictions imposed on all discharges, the factual determinations required by the Guidelines and specifications for a determination of compliance or non-compliance with the Guidelines.

I.2 Summary of 404 (b)(1) analysis

Section 230.10 (a) states no discharge of dredge or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem or other significant adverse environmental consequences.

Section 203.10 (b) establishes three conditions, applicable to inland waters, which must be satisfied to make a finding that a proposed discharge complies with the Guidelines . No discharge of dredged or fill material shall be permitted if it:

a) Violates applicable state water quality standards;

b) Violates any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act; or

c) Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended, or results in a possible destruction or adverse modification of a habitat which is determined to be critical habitat.

Section 230.10 (c) provides that no discharge of dredged or fill material shall be permitted if it will cause or contribute to significant degradation of the waters of the United States, except as provided under Section 404 (b) (2).

Section 230.10 (d) prohibited the discharge of dredge or fill material, except as provided under Section 404 (b) (2) of the Clean Water Act, unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge o the aquatic ecosystem.

Section 230.11 requires the permitting authority to determine in writing the potential short-term or long-term effect of a proposed discharge of dredged or fill material on the physical, chemical, and biological components of the aquatic environment in light of subparts C-F. The determination of effects of each proposed discharge shall include the following:

a) Physical substrate determinations;

b) Water circulation, fluctuation, and salinity determination;
c) Suspended particulate/turbidity determinations;
d) Contaminate determinations;
e) Aquatic ecosystem and organism determinations;
f) Proposed disposal site determinations;
g) Determination of cumulative effects on the aquatic ecosystem; and
h) Determination of secondary effects on the aquatic ecosystem.

I.3 Evaluation of Compliance with 404 b(1) Guidelines; 40 CFR 230.10

(a) No discharge of dredge or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have a less adverse impact on the aquatic ecosystem.

Action alternatives other than the proposed action have about the same or less adverse impact, but fall short of meeting restoration goals. The long-term positive environmental benefits of the proposed action substantially exceed adverse impacts. Conditions in the project area with respect to wetland acreage and diversity, aquatic wildlife habitat abundance and diversity, and wildlife habitat acreage are all substantially improved under the proposed action.

(b) No discharge of dredge and fill material shall be permitted if it:

1. Causes or contributes to violations of State water quality standard;

2. Violates any applicable toxic effluent standard;

3. Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, or adversely impacts areas deemed as critical habitat under the Endangered Species Act of 1973.

Construction and operation of the proposed project will not cause or contribute to violation of State water quality standards, violate any toxic effluent standard, or jeopardize the continued existence of any threatened or endangered species. The Commission has developed several *Standard Operating Procedures* (SOPs) that will ensure that the above requirements are not violated. These SOPs are listed in the FEIS.

(c) No discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of waters of the United States, which considered individually or collectively include:

1. Significantly adverse effects of the discharge of pollutants on human health or welfare.

2. Significantly adverse effects of the discharge of pollutants on life stages of aquatic life and other wild dependent on aquatic ecosystems.

3. Significantly adverse effects of discharge of pollutants on aquatic ecosystem diversity, productivity, and stability.

4. Significantly adverse effects of discharge of pollutants on recreational, aesthetic, and economic values.

In the past, the existing channel was extensively modified and dewatered. Native, productive aquatic habitats have been adversely altered by the Bureau's Provo River Project and the Provo River Water User's perpetual maintenance program. During restoration construction, crews constructing the Proposed Action will temporally disturb benthic aquatic habitats, but the completed project will immediately increase aquatic habitat area and diversity. No pollutants will be discharged into waters of the U.S. that will negatively affect human health, wildlife, recreation, economics, or aesthetic values. **No discharge of dredged or fill material will cause or contribute to significant degradation of any water of the United States**.The Existing Channel Modification alternative would produce impacts similar to the Proposed Action, but would not produce the same level of benefits. The instream Channel Alternative has less impact, but does not substantially improve the river's degraded condition .

(d) *No discharge will be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.*

SOPs listed in chapter one of the Final Environmental Impact Statement will be employed to ensure that impacts to the aquatic ecosystem are minimized and adverse impacts are avoided.

I.4 404 (b) (1) Conclusions

A comparison between the positive and negative impacts between the three action alternatives (i.e. Riverine Habitat Restoration (the Proposed Action), Existing Channel Modification, and Instream Structure Alternatives) indicates that the Riverine Habitat Restoration has the greatest long-term wetland and wildlife benefits in proportion to adverse impacts to the waters of the United States.

MAP A-1
MAP A-2
MAP A-3

Provo River Restoration Project

Map A-1
Major Features of the Proposed Action
(Riverine Habitat Restoration)

Provo River Restoration Project

Map A-2
Major Features of the Existing Channel Modification Alternative

Provo River Restoration Project

Map A-3
Property Acquisition Under the Proposed Action
(Riverine Habitat Restoration)

MAP A-4
MAP A-5
MAP A-6

Provo River Restoration Project

Map A–4
Property Acquisition Under the
Existing Channel Modification Alternative

Provo River Restoration Project

Map A–5
Wetland Impact Areas Under the Proposed Action
(Riverine Habitat Restoration)

Provo River Restoration Project

Map A-6
Wetland Impact Areas Under the
Existing Channel Modification Alternative